Cisco AS5800 Universal Access Server Dial Shelf Card Guide

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Preface

This section discusses document objectives, targeted audience, document organization, document conventions, terms and acronyms, and additional documentation available.

Document Objectives

This document describes the initial hardware installation and troubleshooting of dial shelf cards for the Cisco AS5800 universal access server, which consists of the Cisco 5814 dial shelf and the Cisco 7206 router shelf.

Audience

This publication is designed for the system technician who is responsible for installing the Cisco AS5800 dial shelf cards. The system technician should be familiar with electronic circuitry and wiring practices and have experience as an electronic or electromechanical technician. It is assumed that the system technician has experience with the installation of high-end networking equipment.

This publication includes minimal software configuration instructions for the Cisco AS5800. For more complete software configuration information, refer to the *Cisco AS5800 Universal Access Server Operation, Administration, Maintenance, and Provisioning Guide.*

For a complete description of Cisco IOS software, refer to the Cisco IOS configuration guides and command references, and to the documents listed in the "Related Documentation" section on page xii.

Document Organization

The *Cisco AS5800 Universal Access Server Dial Shelf Card Guide* is organized as follows:

- Chapter 1, "Replacing or Installing Dial Shelf Cards," provides an overview of the system component mechanical functions and the importance of following the correct procedures, and describes the removal and installation of dial shelf cards.
- Chapter 2, "Channelized T1 or E1 Trunk Card," provides an overview of the channelized T1 or E1 trunk card, describes its features, and lists its physical specifications. Also described are the LEDs, clocking, port monitoring, cable and connector pinouts, troubleshooting information, and card-specific configuration information.

- Chapter 3, “Channelized T3 Trunk Card,” provides an overview of the channelized T3 trunk card, describes its features, and lists its physical specifications. Also described are the LEDs, clocking, port monitoring, cable and connector pinouts, troubleshooting information, and card-specific configuration information.
- Chapter 4, “Double-Density Modem Card,” provides an overview of the double-density modem card, describes its features, and lists its physical specifications. Also described are the LEDs, clocking, port monitoring, cable and connector pinouts, troubleshooting information, and card-specific configuration information.
- Chapter 5, “Cisco AS5800 Voice-over-IP Card,” provides an overview of the Voice-over-IP card and describes its features. Also described are the LEDs.
- Chapter 6, “CT1/CE1 Trunk Card,” provides an overview of the 324 universal port card (CT1/CE1 trunk card), which supports modem services, and also includes steps for configuring your software and verifying and troubleshooting your universal port card installation.

Document Conventions

This publication uses the following formatting conventions to convey instructions and information.

Screen displays use the following convention:

- The caret character represents the control key. For example, ^D in a screen display means that you hold down the **Control** key while you press the **D** key.

Command descriptions use these conventions:

- Commands and keywords are in **boldface** font.
- Variables for which you supply values are in *italic* font.
- Elements in square brackets ([ ]) are optional.
- Alternative but required keywords are grouped in braces ({ }) and separated by a vertical bar (|).

Examples use these conventions:

- Terminal sessions are in `screen` font.
- Information you enter is in **`boldface screen`** font.
- Nonprinting characters are shown in angle brackets (< >), in contexts where italics are not available.
- Information displayed on the screen is in `screen` font with default responses in square brackets ([ ]).

Note Means *reader take note*. Notes contain helpful suggestions or references to materials not contained in this manual.

Caution Means *reader be careful*. In this situation, you might do something that could result in equipment damage or loss of data.

Timesaver Means *the action described saves time*. You can save time by performing the action described in the paragraph.

Tips Means *the following information might help you solve a problem.*

Warning **This warning symbol means *danger*. You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents. To see translations of the warnings that appear in this publication, refer to the *Regulatory Compliance and Safety Information* that accompanied this device.**

Waarschuwing **Dit waarschuwingssymbool betekent gevaar. U verkeert in een situatie die lichamelijk letsel kan veroorzaken. Voordat u aan enige apparatuur gaat werken, dient u zich bewust te zijn van de bij elektrische schakelingen betrokken risico's en dient u op de hoogte te zijn van standaard maatregelen om ongelukken te voorkomen. Voor vertalingen van de waarschuwingen die in deze publicatie verschijnen, kunt u het document *Regulatory Compliance and Safety Information* (Informatie over naleving van veiligheids- en andere voorschriften) raadplegen dat bij dit toestel is ingesloten.**

Varoitus **Tämä varoitusmerkki merkitsee vaaraa. Olet tilanteessa, joka voi johtaa ruumiinvammaan. Ennen kuin työskentelet minkään laitteiston parissa, ota selvää sähkökytkentöihin liittyvistä vaaroista ja tavanomaisista onnettomuuksien ehkäisykeinoista. Tässä julkaisussa esiintyvien varoitusten käännökset löydät laitteen mukana olevasta *Regulatory Compliance and Safety Information* -kirjasesta (määräysten noudattaminen ja tietoa turvallisuudesta).**

Attention **Ce symbole d'avertissement indique un danger. Vous vous trouvez dans une situation pouvant causer des blessures ou des dommages corporels. Avant de travailler sur un équipement, soyez conscient des dangers posés par les circuits électriques et familiarisez-vous avec les procédures couramment utilisées pour éviter les accidents. Pour prendre connaissance des traductions d'avertissements figurant dans cette publication, consultez le document *Regulatory Compliance and Safety Information* (Conformité aux règlements et consignes de sécurité) qui accompagne cet appareil.**

Warnung **Dieses Warnsymbol bedeutet Gefahr. Sie befinden sich in einer Situation, die zu einer Körperverletzung führen könnte. Bevor Sie mit der Arbeit an irgendeinem Gerät beginnen, seien Sie sich der mit elektrischen Stromkreisen verbundenen Gefahren und der Standardpraktiken zur Vermeidung von Unfällen bewußt. Übersetzungen der in dieser Veröffentlichung enthaltenen Warnhinweise finden Sie im Dokument *Regulatory Compliance and Safety Information* (Informationen zu behördlichen Vorschriften und Sicherheit), das zusammen mit diesem Gerät geliefert wurde.**

Avvertenza **Questo simbolo di avvertenza indica un pericolo. La situazione potrebbe causare infortuni alle persone. Prima di lavorare su qualsiasi apparecchiatura, occorre conoscere i pericoli relativi ai circuiti elettrici ed essere al corrente delle pratiche standard per la prevenzione di incidenti. La traduzione delle avvertenze riportate in questa pubblicazione si trova nel documento *Regulatory Compliance and Safety Information* (Conformità alle norme e informazioni sulla sicurezza) che accompagna questo dispositivo.**

Advarsel **Dette varselsymbolet betyr fare. Du befinner deg i en situasjon som kan føre til personskade. Før du utfører arbeid på utstyr, må du vare oppmerksom på de faremomentene som elektriske kretser innebærer, samt gjøre deg kjent med vanlig praksis når det gjelder å unngå ulykker. Hvis du vil se oversettelser av de advarslene som finnes i denne publikasjonen, kan du se i dokumentet *Regulatory Compliance and Safety Information* (Overholdelse av forskrifter og sikkerhetsinformasjon) som ble levert med denne enheten.**

Aviso **Este símbolo de aviso indica perigo. Encontra-se numa situação que lhe poderá causar danos físicos. Antes de começar a trabalhar com qualquer equipamento, familiarize-se com os perigos relacionados com circuitos eléctricos, e com quaisquer práticas comuns que possam prevenir possíveis acidentes. Para ver as traduções dos avisos que constam desta publicação, consulte o documento *Regulatory Compliance and Safety Information* (Informação de Segurança e Disposições Reguladoras) que acompanha este dispositivo.**

¡Advertencia! **Este símbolo de aviso significa peligro. Existe riesgo para su integridad física. Antes de manipular cualquier equipo, considerar los riesgos que entraña la corriente eléctrica y familiarizarse con los procedimientos estándar de prevención de accidentes. Para ver una traducción de las advertencias que aparecen en esta publicación, consultar el documento titulado *Regulatory Compliance and Safety Information* (Información sobre seguridad y conformidad con las disposiciones reglamentarias) que se acompaña con este dispositivo.**

Varning! **Denna varningssymbol signalerar fara. Du befinner dig i en situation som kan leda till personskada. Innan du utför arbete på någon utrustning måste du vara medveten om farorna med elkretsar och känna till vanligt förfarande för att förebygga skador. Se förklaringar av de varningar som förkommer i denna publikation i dokumentet *Regulatory Compliance and Safety Information* (Efterrättelse av föreskrifter och säkerhetsinformation), vilket medföljer denna anordning.**

Preventing Electrostatic Discharge Damage

Electrostatic discharge (ESD) damages equipment and impairs electrical circuitry. ESD occurs when printed circuit cards are improperly handled and results in complete or intermittent failure.

The system feature cards and dial shelf controller cards consist of a printed circuit card that is fixed in a metal carrier. Electromagnetic interference (EMI) shielding, connectors, and ejector levers are integral components of the carrier. Handle cards by their carrier edges or ejector levers only; never touch the printed circuitry, card components, or connector pins.

Although the metal carrier helps to protect the printed circuitry from ESD, you should wear a preventive antistatic strap whenever handling the feature cards or dial shelf controller cards. Ensure that the strap makes good skin contact and connect the strap's clip to an unpainted chassis surface to safely channel unwanted ESD voltages to ground.

If no wrist strap is available, ground yourself by touching the metal part of the chassis.

Following are guidelines for preventing ESD damage:

- Always use an ESD wrist strap or ankle strap when installing or replacing modem cards. Ensure that the ESD strap makes contact with your skin.
- Handle all system components by their metal carrier edges and ejector levers only; avoid touching the printed circuitry, card components, or any connector pins.

- Place all system components that have been removed on an antistatic surface with the printed circuit card components facing upward or in a static shielding bag. If you are returning a feature card to the factory, immediately place it in a static shielding bag.

Caution Periodically check the resistance value of the antistatic strap. The measurement should be within the range of 1 to 10 megohm.

Safety Guidelines

This section provides safety and ESD-prevention guidelines to help you avoid injury to yourself and avoid damage to the equipment. We recommend the following safety guidelines when working with any equipment that connects to electrical power or telephone wiring:

- Locate the emergency power Off switch for the room in which you are working before beginning any procedures requiring access to the chassis interior.
- Never work alone if potentially hazardous conditions exist.
- Never assume that power has been disconnected from a circuit; always check.
- Never perform any action that creates a potential hazard to people or makes the equipment unsafe.
- Carefully examine your work area for possible hazards such as moist floors, ungrounded power extension cables, and missing safety grounds.

Telephone Wiring Guidelines

Cisco recommends the following guidelines when working with any equipment that is connected to telephone wiring or to other network cabling:

- Never install telephone wiring during a lightning storm.
- Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.
- Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.
- Always use caution when installing or modifying telephone lines.

Related Documentation

The Cisco IOS software running your Cisco AS5800 includes extensive features and functionality. For information regarding the Cisco AS5800 that is beyond the scope of this document, or for additional information, use the following resources:

Timesaver Make sure that you have access to the documents listed in Table 1. These documents are available in print, on CD-ROM, and on the World Wide Web. If you need further assistance, see the “Obtaining Documentation” section on page xiv.

Table 1 Related and Referenced Documents

Cisco Product	Document Title
Cisco AS5800 Universal Access Server	• *Read Me First* • *Cisco AS5800 Universal Access Server Hardware Installation Guide* • *Cisco AS5800 Universal Access Server Dial Shelf Card Guide* (this guide) • *Cisco AS5800 Universal Access Server Operation, Administration, Maintenance, and Provisioning Guide* • *Voice over IP for the Cisco AS5800* (available online only) • *Cisco AS5800 Universal Access Server Regulatory Compliance and Safety Information*
Cisco 7206 router shelf	• *Cisco 7206 Installation and Configuration Guide* • *Cisco 7200 Series Port Adapter Hardware Configuration Guidelines* • *Regulatory Compliance and Safety Information for the Cisco 7200 Series Routers* • Configuration notes, updates, and release notes
Cisco 5814 dial shelf	• Configuration notes, updates, and release notes
System controller	• *Read Me First* • *Cisco 3640 System Controller Installation and Configuration Guide* • *Cisco 3640 Router Installation and Configuration Guide* • Configuration notes, updates, and release notes
Network management system	• Configuration notes, updates, and release notes
Cisco IOS software[1]	• *Configuration Fundamentals Configuration Guide* • *Configuration Fundamentals Command Reference* • *Dial Solutions Configuration Guide* • *Wide-Area Networking Configuration Guide* • *Wide-Area Networking Command Reference* • *Network Protocols Configuration Guide* • *Network Protocols Command Reference* • *Configuration Builder Getting Started Guide* • *Troubleshooting Internetworking Systems* • *Debug Command Reference* • *System Error Messages* • *Cisco IOS Software Command Summary* • *Cisco Management Information Base (MIB) User Quick Reference*

1. Refer to the modular reference publications that correspond to the Cisco IOS software release installed on your access server.

New Hardware Features

New hardware features available after the release of this document can be found at the following URL:

http://www.cisco.com/univercd/cc/td/doc/product/access/acs_serv/as5800/index.htm

New dial shelf cards will be added to the *Cisco AS5800 Universal Access Server Dial Shelf Card Guide*, and other changes to Cisco AS5800 hardware will be addressed in the *Cisco AS5800 Universal Access Server Hardware Installation Guide.*

Obtaining Documentation

The following sections provide sources for obtaining documentation from Cisco Systems.

World Wide Web

You can access the most current Cisco documentation on the World Wide Web at the following sites:

- http://www.cisco.com
- http://www-china.cisco.com
- http://www-europe.cisco.com

Documentation CD-ROM

Cisco documentation and additional literature are available in a CD-ROM package, which ships with your product. The Documentation CD-ROM is updated monthly and may be more current than printed documentation. The CD-ROM package is available as a single unit or as an annual subscription.

Ordering Documentation

Cisco documentation is available in the following ways:

- Registered Cisco Direct Customers can order Cisco Product documentation from the Networking Products MarketPlace:

  http://www.cisco.com/cgi-bin/order/order_root.pl

- Registered Cisco.com users can order the Documentation CD-ROM through the online Subscription Store:

  http://www.cisco.com/go/subscription

- Nonregistered CCO users can order documentation through a local account representative by calling Cisco corporate headquarters (California, USA) at 408 526-7208 or, in North America, by calling 800 553-NETS(6387).

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San Jose, CA 95134-9883

We appreciate your comments.

Obtaining Technical Assistance

Cisco provides Cisco.com as a starting point for all technical assistance. Customers and partners can obtain documentation, troubleshooting tips, and sample configurations from online tools. For Cisco.com registered users, additional troubleshooting tools are available from the TAC website.

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Technical Assistance Center

The Cisco TAC website is available to all customers who need technical assistance with a Cisco product or technology that is under warranty or covered by a maintenance contract.

Contacting TAC by Using the Cisco TAC Website

If you have a priority level 3 (P3) or priority level 4 (P4) problem, contact TAC by going to the TAC website:

http://www.cisco.com/tac

P3 and P4 level problems are defined as follows:

- P3—Your network performance is degraded. Network functionality is noticeably impaired, but most business operations continue.
- P4—You need information or assistance on Cisco product capabilities, product installation, or basic product configuration.

In each of the above cases, use the Cisco TAC website to quickly find answers to your questions.

To register for Cisco.com, go to the following website:

http://www.cisco.com/register/

If you cannot resolve your technical issue by using the TAC online resources, Cisco.com registered users can open a case online by using the TAC Case Open tool at the following website:

http://www.cisco.com/tac/caseopen

Contacting TAC by Telephone

If you have a priority level 1(P1) or priority level 2 (P2) problem, contact TAC by telephone and immediately open a case. To obtain a directory of toll-free numbers for your country, go to the following website:

http://www.cisco.com/warp/public/687/Directory/DirTAC.shtml

P1 and P2 level problems are defined as follows:

- P1—Your production network is down, causing a critical impact to business operations if service is not restored quickly. No workaround is available.
- P2—Your production network is severely degraded, affecting significant aspects of your business operations. No workaround is available.

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We appreciate and value your comments.

Replacing or Installing Dial Shelf Cards

This chapter describes system component mechanical functions and emphasizes the importance of following the correct procedures to avoid unnecessary circuit card failures. This chapter is for background information only.

Online Insertion and Removal

The Cisco AS5800 universal access server supports online insertion and removal (OIR). This feature allows you to remove and replace a trunk card or port-handling card, while the system is operating, without affecting system operation.

Caution In order to maintain traffic flow in a single dial shelf controller (DSC) configuration, the DSC shouldn't be removed while the system is operational. If the DSC is removed, the interconnect link between the DSC and router shelf will be lost and all other dial shelf cards will go down. The router console port will display the following message:

```
AUG 2 10:57:02.017 CST: %DSC_REDUNDANCY-3-BICLINK: Link to active DSC down
```

Each dial shelf card contains a female connector that connects to a male connector on the system backplane. Each male backplane connector comprises a set of tiered pins in two lengths. The backplane pins send specific signals to the system as they make contact with the card connectors. The system assesses the signals it receives and the order in which it receives them to determine what event is occurring and what task it needs to perform, such as reinitializing new interfaces or shutting down removed ones.

Each dial shelf card is designed with two ejector levers to be used when you install or remove a card. The function of the ejector levers is to align and securely seat the card connectors in the backplane.

Caution Do not force the dial shelf cards into a slot, as this can damage the backplane connector pins if they are not aligned properly with the card connectors.

Busyout Command

To remove a CT1/CE1 trunk card without dropping calls or connections, you must first take the card out of service by using the **busyout** command to remove DS0s and modem resources from the available pool as calls are completed. The **busyout** command is run on a per card (slot) basis.

The **busyout** command has the format **busyout** *shelf number/slot number,* where *shelf number* is a user-designated value from 0 to 9999 and *slot number* is 0 to 5. The following example shows how to busyout the card in slot 0 on shelf 5:

```
AS5800# busyout 5/0
AS5800#
```

If you are replacing a failed card, we recommend that you proceed as follows:

1. Use the busyout command to take the card out of service.
2. Remove the existing card.
3. Install the new card in the same slot.

If you are replacing a CT1/CE1 trunk card with a new CT1/CE1 trunk card of the same type in the same slot, the system software recognizes the new CT1/CE1 trunk card interfaces and brings them up automatically. No additional configuration is needed. A CT1/CE1 trunk card installed in a different slot affects the clocking source.

Note The system brings online only interfaces that match the current configuration and were previously configured as up; all other interfaces require that you configure them with the **configure** command. For information on the **configure** command, refer to the *Cisco AS5800 Universal Access Server Operation, Administration, Maintenance, and Provisioning Guide* that shipped with your system.

Required Materials

You need the following supplies to install a CT1/CE1 trunk card. Contact a service representative for ordering information if you need additional materials.

- Dial shelf card
- Interface cables and cable ties
- No. 2 Phillips screwdriver
- Your own ESD-prevention equipment or the disposable grounding wrist strap included with all upgrade kits, field replaceable units (FRUs), and spares.
- An antistatic mat or foam pad, and an antistatic bag (if replacing an installed and configured card with a new card)
- *Cisco AS5800 Universal Access Server Operation, Administration, Maintenance, and Provisioning Guide*
- *Cisco AS5800 Universal Access Server Dial Shelf Card Guide* (this guide)
- *Cisco AS5800 Universal Access Server Regulatory Compliance and Safety Information*

Removing a Dial Shelf Card

To remove a CT1/CE1 trunk card from the (Cisco 5814) dial shelf, complete the following steps:

Warning **Before opening the chassis, disconnect the telephone network cables to avoid contact with telephone network voltages. To see translations of the warnings that appear in this publication, refer to the *Regulatory Compliance and Safety Information* document that accompanied this device.**

Caution Trunk cards weigh 8 lb (3.6 kg) each. Use two hands when removing or replacing a trunk card.

Caution To avoid erroneous failure messages, remove or insert only one dial shelf card at a time. Also, after inserting or removing a dial shelf card, allow at least 15 seconds before removing or inserting another dial shelf card so that the system can reinitialize and note the current configuration of all interfaces.

Step 1 Note the slot in which the card is installed. If you are replacing a dial shelf card with a new dial shelf card of the same type in the same slot, the system software recognizes the new dial shelf card interfaces and brings them up automatically. No additional configuration is needed.

Step 2 Initialize the software busyout procedure by entering the following console command in privileged EXEC mode:

```
busyout shelf-number/slot-number
```

Step 3 Verify that the yellow maintenance LED on the card lights, which indicates that the card is offline and ready to be removed.

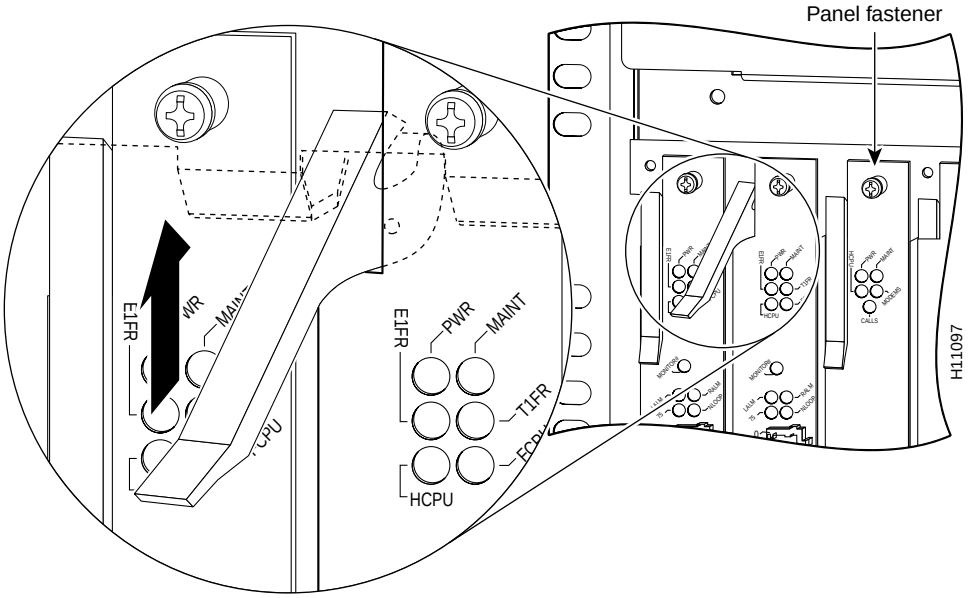
Step 4 Attach an ESD-preventive wrist strap between you and an unpainted chassis surface.

Caution To prevent ESD damage, handle cards by ejector levers and carrier edges only, and use an ESD-preventive wrist strap or other grounding device.

Step 5 Disconnect all cables and secure them out of the way, using cable ties, if necessary.

Step 6 Using a No. 2 Phillips screwdriver, loosen the panel fasteners at the top and bottom of the card front panel. (See Figure 1-1.)

Figure 1-1 Using the Ejector Lever



Step 7 Pull either the top or bottom ejector lever away from the card's front panel to disengage the trunk card from the backplane connector. (See Figure 1-2.)

Caution Always use the ejector levers to disengage or seat dial shelf cards in the backplane. Failure to do so can cause erroneous system error messages indicating a card failure. However, do *not* use the ejector levers to lift or support the weight of the cards.

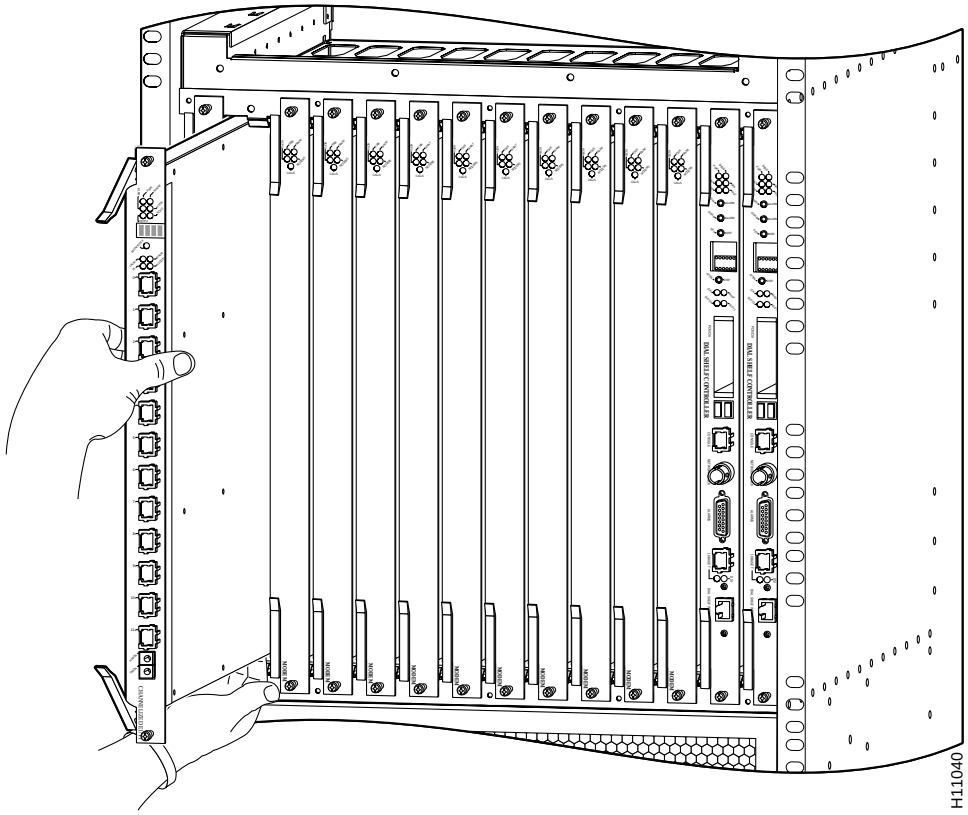
Step 8 Grasp the ejector levers and pull the card partially out of the dial shelf slot until you can grasp the card front panel with one hand. Place your other hand under the card to balance the weight of the card as you pull it out of the slot. (See Figure 1-2.)

Step 9 For all cards, read the following warning, then proceed to Step 10.

Warning **High performance devices on this card can get hot during operation, To remove the card, hold it by the faceplate and bottom edge. Allow the card to cool before touching any other part of it or placing it in an anti-static bag. To see translations of the warnings that appear in this publication, refer to the *Regulatory Compliance and Safety Information* document that accompanied this device.**

Step 10 Pull the card straight out of the slot. Avoid touching the circuitry or any connector pins.

Figure 1-2 Removing or Replacing a CT1/CE1 Trunk Card



Step 11 Place the removed card on an antistatic mat or foam pad until you are ready to reinstall it in the chassis. If you plan to return the card to the factory, place it in an antistatic bag.

This completes the CT1/CE1 trunk card removal procedure. To install a CT1/CE1 trunk card, proceed to the following section, "Installing a Dial Shelf Card."

Installing a Dial Shelf Card

To install a new CT1/CE1 trunk card in the Cisco 5814 dial shelf, follow these steps:

Caution Trunk cards weigh 8 lb (3.6 kg) each. Use two hands when removing or replacing a card.

Caution To avoid erroneous failure messages, remove or insert only one dial shelf card at a time. Also, after inserting or removing a dial shelf card, allow at least 15 seconds before removing or inserting another dial shelf card so that the system can reinitialize and note the current configuration of all interfaces.

Step 1 Attach an ESD-preventive wrist strap between you and an unpainted chassis surface.

Caution To prevent ESD damage, handle cards by ejector levers and carrier edges only, and use an ESD-preventive wrist strap or other grounding device.

Step 2 Carefully align the card carrier guides with the top and bottom grooves in the dial shelf slot. Avoid touching the circuitry or any connector pins.

Step 3 Slide the card into the slot until the ejector levers make contact with the chassis frame. (See Figure 1-2.)

Step 4 Seat the card in the backplane by pushing the card firmly until the ejector levers fold in toward the card's front panel and the front panel is flush with the chassis frame.

Caution Always use the ejector levers to disengage or seat trunk cards, modem cards, VoIP cards, or dial shelf controller cards in the backplane. Failure to do so can cause erroneous system error messages indicating a card failure. However, do *not* use the ejector levers to lift or support the weight of the cards.

Step 5 Tighten the panel fasteners using a No. 2 Phillips screwdriver. This secures the backplane connection and ensures proper EMI shielding.

Caution Always tighten the panel fasteners. These fasteners prevent accidental removal and provide proper grounding for the system.

Step 6 Repeat Step 2 through Step 5 for any other CT1/CE1 trunk cards that you want to install.

Step 7 Install a blank filler card (DS58-BLANK=) in all empty card slots to keep the chassis dust-free and maintain proper airflow.

Caution To prevent the overheating of internal components, always install blank filler cards in empty slots to maintain the proper flow of cooling air across the cards.

This completes the CT1/CE1 trunk card replacement procedure.

CHAPTER 2

Channelized T1 or E1 Trunk Card

The Cisco AS5800 universal access server supports channelized T1 (CT1) and channelized E1 (CE1) ingress interfaces that provide a synchronous telecommunications interface in both North American and international environments. The CT1/CE1 trunk card is installed in the Cisco 5814 dial shelf in the Cisco AS5800.

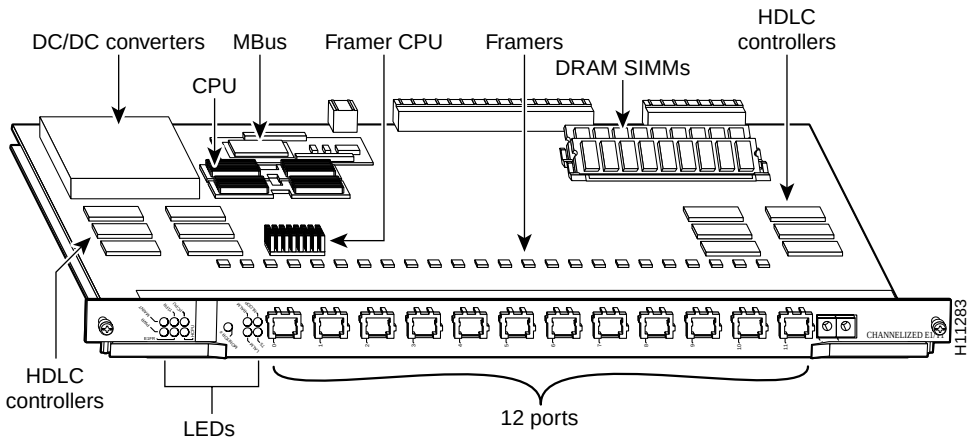
This chapter describes the , and it also includes steps for verifying and troubleshooting your CT1/CE1 trunk card installation.

CT1 and CE1 Trunk Card Overview

Channelized T1 or E1 ingress interfaces reside on CT1/CE1 trunk cards that are installed in the Cisco 5814 dial shelf. A CT1/CE1 trunk card contains all necessary functionality to terminate incoming telephone calls. The channelized trunk card is configured in the factory for either T1 or E1 framing, depending on your order.

Figure 2-1 shows the CT1 and CE1 trunk card components.

Figure 2-1 CT1 and CE1 Trunk Card



The CT1 and CE1 trunk cards perform the following functions:

- Terminate as many as 12 T1 or 12 E1 lines

  The CT1 trunk card provides physical termination for as many as 12 T1/Primary Rate Interface (PRI) lines, includes channel service units (CSUs), and connects directly to the telco network. The CE1 trunk card provides physical termination for as many as 12 E1 lines and connects to an external network termination (NT1) device.

- Demultiplex calls

  A framer removes framing and embedded signaling bits (or inserts them, depending on the direction of the flow), and the framer CPU sends the data stream to onboard time-division multiplexing (TDM) resources, which break out each call (DS0) and pass each call to an appropriate call termination resource. Digital or ISDN-originated calls are terminated onboard the CT1/CE1 trunk card on High-Level Data Link Control (HDLC) controllers, and analog modem-originated calls are passed over the dial shelf backplane TDM bus to an available modem resource. The system software controls modem and HDLC resource management.

- Respond to time-sensitive signaling

  Each T1 or E1 port can be used as the system clocking reference. Each CT1/CE1 trunk card can supply two clocks from any two of its 12 ports. You can assign priorities to these clocks or accept the default values assigned by the software.

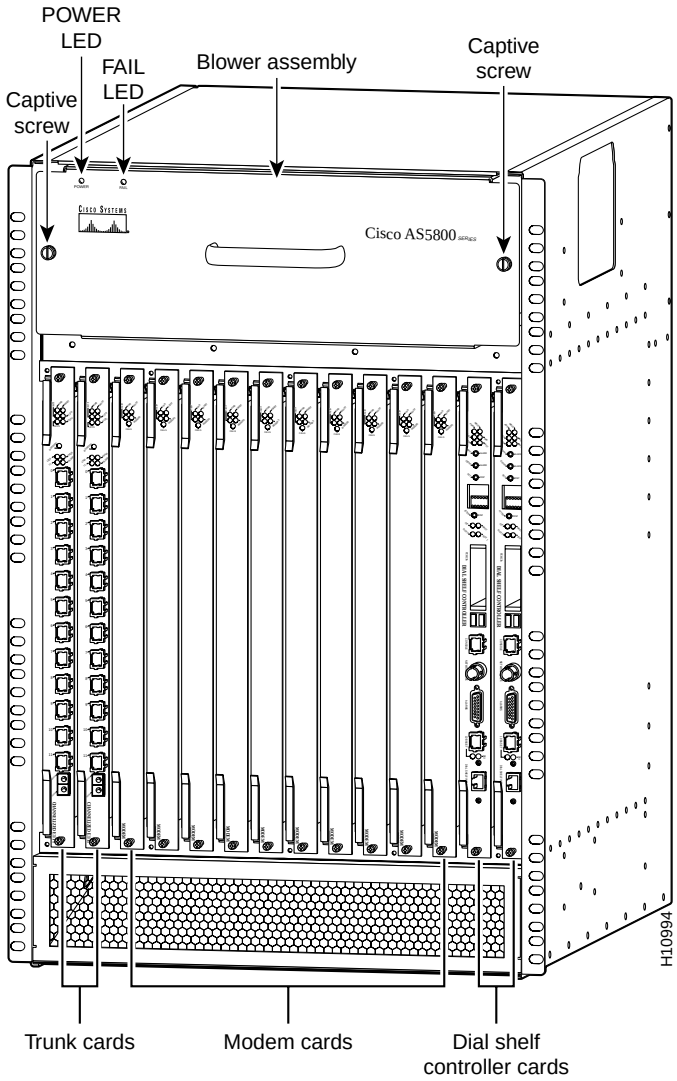
- Process counting information for performance monitoring

- Support online insertion and removal (OIR)

  The CT1/CE1 trunk card supports OIR, a feature that allows you to remove and replace trunk cards in the Cisco 5814 dial shelf while the system is operating, without disrupting other cards and their associated calls. If you remove a trunk card while the system is operating, all calls associated with the lines on that card are dropped. Calls being handled by other trunk or modem cards, however, are not affected. For more information, see the “Busyout Command” section on page 1-1.

Figure 2-2 shows two CT1/CE1 trunk cards installed in a fully-configured Cisco 5814 dial shelf chassis.

Figure 2-2 Cisco 5814 Dial Shelf Chassis Fully Configured with Cards Installed



Clocking

All Cisco AS5800 access server trunk cards use the same transmit clock. This clock can originate from the following sources:

- TDM clock source—A priority value from 1 to 50 that is applied to a clock source when multiple clock sources are used
- External clock source—A clock source external to the access server

Clocks are prioritized by slot number (slots 0 to 5). The highest-priority clock is selected from the card in slot 0 and used as the default clock. If this clock fails, the highest-priority clock from the card in slot 1 becomes the default clock, and so forth.

The trunk card then forwards the clocks to the dial shelf controller. The dial shelf controller selects the highest-priority clock as the system primary clock, and the rest of the clocks remain in a prioritized backup queue.

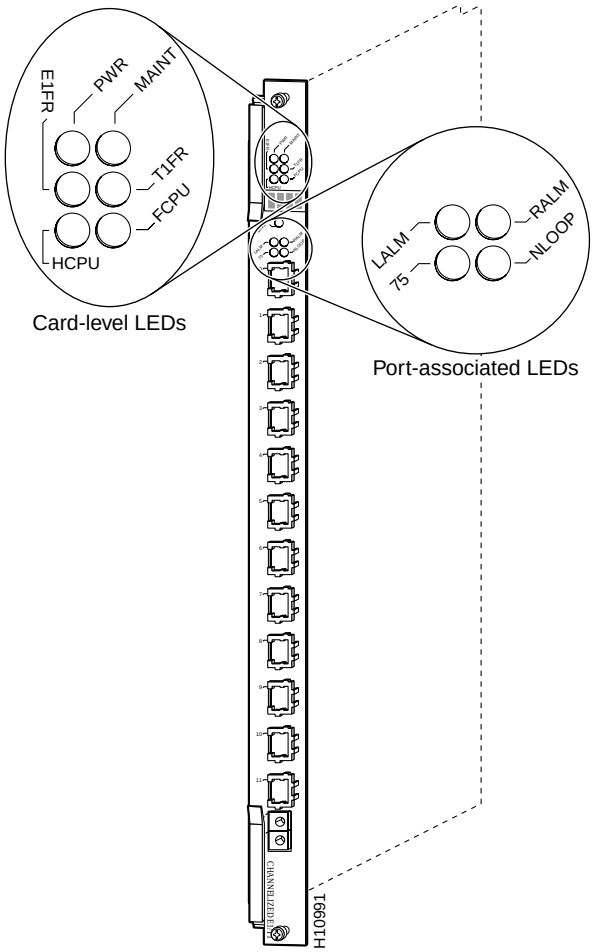
Instead of using the default algorithm for clock selection, you can specify clocks through global configuration and select a maximum of two clocks per trunk card.

If you configure fewer than two clocks on a trunk card and all other configured clocks fail, clock selection resorts to the default algorithm on that card and the second clock will be selected automatically.

LED and LCD Indicators

The CT1 and CE1 trunk card front panels are designed with LED indicators (Figure 2-3) and a liquid crystal display (LCD) (See Figure 2-4) to provide trunk card status and port-level monitoring information.

Figure 2-3 CT1 and CE1 Trunk Card Front Panel LEDs



There are two types of LEDs for the T1 and E1 trunk cards:

- Card-level LEDs, which provide status information for card maintenance
- Port-associated LEDs, which provide warning signals and configuration status for individual ports

All LEDs are visible from the front panel. (See Figure 2-3.)

Table 2-1 lists the CT1 and CE1 trunk card LEDs and their functions.

Table 2-1 CT1 and CE1 Trunk Card LED Indicators

LED	Color	Description
PWR	Green	Power—Lights when 5V power is active.
MAINT	Yellow	Maintenance—Lights when there are no active calls on the card and you have completed a card-level software busyout. Indicates that the card is ready to be removed.
E1FR	Green	E1 framing—E1 trunk card only. Lights when the card is configured for E1 framing.
T1FR	Green	T1 framing—T1 trunk card only. Lights when the card is configured for T1 framing.
HCPU	Green	Host CPU—Lights when the host CPU is operating normally.
FCPU	Green	Framer CPU—Lights when the framer CPU is operating normally.

CT1 and CE1 Trunk Card Port Monitoring

The CT1 and CE1 trunk card front panels are designed with an LCD to provide trunk card status and port-level monitoring information. (See Figure 2-4.) The current port number displayed in the LCD corresponds to the four port-associated LEDs.

Table 2-2 describes the port-associated LEDs and their functions.

Table 2-2 CT1 and CE1 Trunk Card Port-Associated LEDs

LED	Color	Description
LALM	Yellow	Local alarm—Lights when an alarm condition is detected on incoming data.
RALM	Yellow	Remote alarm—Lights when the associated E1 port has detected loss of signal (LOS) or out-of-frame (OOF) errors. This occurs when the remote LIU[1] receives errors and sends a signal to indicate the presence of remote errors.
75	Green	Ohm—E1 trunk card only. ON indicates 75 ohms, and OFF indicates 120 ohms.
NLOOP	Yellow	Network loopback—Lights when the port is configured in network loopback. This is useful for testing purposes.

1. LIU = line interface unit (analog physical interface). Refers to circuitry that interfaces a serial communications circuit to a transmission medium such as coaxial cabling.

Trunk Card Bantam Jacks

Passive port monitoring is supported through two shared bantam jacks located at the bottom of the trunk card front panel. (See Figure 2-4.) The bantam jacks allow you to connect a network monitoring device to the trunk card to detect T1 or E1 errors.

The four-character LCD indicates which line is to be monitored or inspected using the bantam jacks.

To enable the bantam jacks for port monitoring, follow these steps:

Step 1 Push and quickly release the monitor button below the LCD to toggle to the port number you want to monitor.

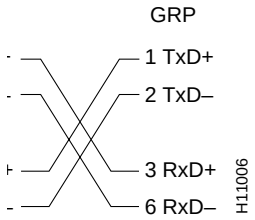
You must release the button within 2 seconds to advance through the port numbers (from 0 to 11). After port 11, the display returns to port 0. As you advance through the port numbers, the LEDs reflect configuration status and alarm conditions for the port number displayed in the LCD.

Step 2 Push and hold the monitor button for 2 or more seconds to enable the bantam jack. To disable the bantam jack and return to toggle mode, press the button again and hold it for two or more seconds.

When you release the button, the port LCD no longer toggles through the port numbers, the letter “B” is displayed in the LCD, and the bantam jacks are enabled.

Step 3 Repeat Step 1 and Step 2 to enable the bantam jacks for each port that you want to monitor.

Figure 2-4 CT1 and CE1 Trunk Card Front Panel LCD and Bantam Jacks



Specifications

Table 2-3 lists the CT1 and CE1 trunk card specifications.

Table 2-3 CT1 and CE1 Trunk Card Specifications

Description	Specification
Dimensions H x W x L	15.4 x 0.08 x 18.7 in. (39.12 x 0.203 x 47.5 cm) without the carrier 15.5 x 1.23 x 19 in. (39.37 x 3.12 x 48.26 cm) with the carrier
Weight	8 lb (3.6 kg)
Transmission bit rate	
T1 E1	1.544 Mbps 2.048 Mbps
Power requirements	48 VDC (power consumption: 3.3 VDC and 5 VDC)
Regulatory compliance and safety[1]	
T1	AT&T Accunet TR 62411 specifications; JATE[2] T98-6304-0; Pan-Euro CE-0168-X
E1	ACA TS001, A53260; JATE N98-N019-0; Sweden 98031130; Singapore ISDN2-IPTA-AE 0345-98; Singapore DLCN1-MBPS-AO-0344-98; UK 607122

1. See also the regulatory compliance and safety document that shipped with your Cisco AS5800.
2. JATE = Japan Approval Telecommunication Equipment.

CT1 and CE1 Trunk Card Port Pinout

The CT1 trunk card receives and transmits 1.544-Mbps signals through a 100-ohm cable, using common RJ-45 connectors. Use a straight-through RJ-45 to RJ-45 cable to connect the T1 lines to an RJ-45 receptacle.

The CE1 trunk card receives and transmits 2.048-Mbps CE1 signals through either 120-ohm or 75-ohm coaxial cable. All CE1 interface cables use common RJ-45 connectors on the dial shelf end.

The receive impedance is software configurable as 75 ohms or 120 ohms. The T1 default value is 100 ohms. The E1 default value is 120 ohms. Use the **line termination** command in controller configuration mode to configure the receive impedance.

Table 2-4 lists the CT1 and CE1 port pinouts.

Table 2-4 CT1 and CE1 Trunk Card Port (RJ-45) Pinouts

Pin	Signal
1	Receive tip
2	Receive ring
3	Jumpered ground
4	Transmit tip
5	Transmit ring
6	Jumpered ground
7	Not used
8	Not used

Warning **To avoid electric shock, do not connect safety extra-low voltage (SELV) circuits to telephone network voltage (TNV) circuits. LAN ports contain SELV circuits and WAN ports contain TNV circuits. Some LAN and WAN ports both use RJ-45 connectors. To see translations of the warnings that appear in this publication, refer to the *Regulatory Compliance and Safety Information* that accompanied this device.**

CT1 Trunk Card Cables and Pinouts

One interface cable is available from Cisco Systems for connecting the CT1 card ports. The cable is described in Table 2-5.

Table 2-5 CT1 Interface Cable

Cable Description	Product Number
RJ-45 to bare wire, 100-ohm	CAB-T1-RJ45BARE

Figure 2-5 shows the CT1 interface cable, and Table 2-6 describes the pinouts for the CT1 interface cable.

Figure 2-5 RJ-45 to Bare Wire Interface Cable

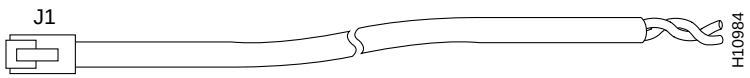


Table 2-6 RJ-45 to Bare Wire Interface Cable Pinouts

RJ-45 Pin	Signal	Description	Direction	Bare
Shield	Ground	Braid	—	—
J1-1	RX Tip	Twisted Pair #1	<—	WIRE-1
J1-2	RX Ring	Twisted Pair #1	<—	WIRE-2
J1-3	RX Shield	—	—	—
J1-4	TX Tip	Twisted Pair #2	—>	WIRE-3
J1-5	TX Ring	Twisted Pair #2	—>	WIRE-4
J1-6	TX Shield	—	—	—

CE1 Trunk Card Cables and Pinouts

Seven interface cables are available from Cisco Systems for connecting the CE1 card ports. These cables and their product numbers are listed in Table 2-7, along with the number of the figure and table detailing their pinouts.

Table 2-7 CE1 Interface Cables

Cable Description	Product Number	Illustration	Pinout
RJ-45 to RJ-45, 120-ohm	CAB-E1-RJ45RJ45	Figure 2-6	Table 2-8
RJ-45 to DB-15, 120-ohm	CAB-E1-RJ45DB15	Figure 2-7	Table 2-9
RJ-45 to DB-15 null, 120-ohm	CAB-E1-RJ45DB15N	Figure 2-7	Table 2-10
RJ-45 to BNC, 75-ohm	CAB-E1-RJ45BNC	Figure 2-8	Table 2-11
RJ-45 to Twinax, 75-ohm	CAB-E1-RJ45TWIN	Figure 2-9	Table 2-12
RJ-45 to RJ-45 TE, 120-ohm	CAB-E1-RJ45TE	Figure 2-10	Table 2-13
RJ-45 to RJ-45 NT, 120-ohm	CAB-E1-RJ45NT	Figure 2-10	Table 2-14

Figure 2-6 RJ-45 to RJ-45 Interface Cable

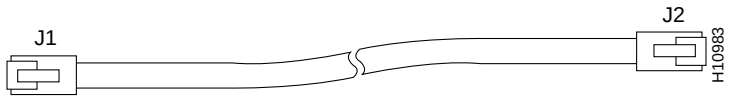


Table 2-8 RJ-45 to RJ-45 E1 Cable Pinouts (Crossover)

RJ-45 Pin	Signal	Description	Direction	RJ-45 T1 Pin
Shield	Ground	Shell/Braid	—	Shield
J1-1	RX Tip	Twisted Pair #1	<—	J2-4
J1-2	RX Ring	Twisted Pair #1	<—	J2-5
J1-3	—	RX Shield	—	—
J1-4	TX Tip	Twisted Pair #2	—>	J2-1
J1-5	TX Ring	Twisted Pair #2	—>	J2-2
J1-6	—	TX Shield	—	—

Figure 2-7 RJ-45-to-DB-15 Interface Cable

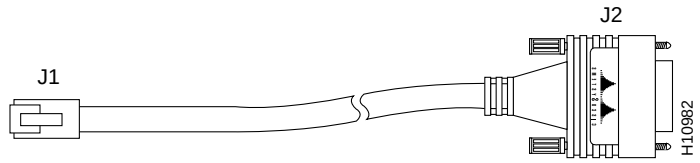


Table 2-9 RJ-45 to DB-15 Cable Pinouts

RJ-45 Pin	Signal	Description	Direction	DB-15 Pin
Shield	Ground	Shell/Braid	—	Shell
J1-1	RX Tip	Twisted Pair #1	<—	J2-3
J1-2	RX Ring	Twisted Pair #1	<—	J2-11
J1-3	RX Shield	Twisted Pair #3	—	J2-4
J1-4	TX Tip	Twisted Pair #2	—>	J2-1
J1-5	TX Ring	Twisted Pair #2	—>	J2-9
J1-6	TX Shield	Twisted Pair #4	—	J2-2

Table 2-10 RJ-45 to DB-15 Null-Modem Cable Pinouts

RJ-45 Pin	Signal	Description	Direction	DB-15 Pin
Shield	Ground	Shell/Braid	—	Shell
J1-1	RX Tip	Twisted Pair #1	<—	J2-1
J1-2	RX Ring	Twisted Pair #1	<—	J2-9
J1-3	RX Shield	Twisted Pair #3	—	J2-2
J1-4	TX Tip	Twisted Pair #2	—>	J2-3
J1-5	TX Ring	Twisted Pair #2	—>	J2-11
J1-6	TX Shield	Twisted Pair #4	—	J2-4

Figure 2-8 RJ-45 to BNC Interface Cable for 75-Ohm (Unbalanced Connections)

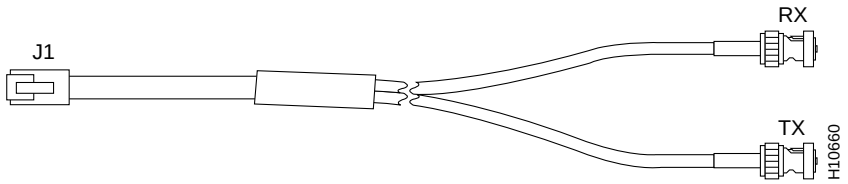


Table 2-11 RJ-45 to BNC Cable Pinouts

RJ-45 Pin	Signal	Description	Direction	BNC Pin
Shield	Ground	Shell	—	RX, TX Shields
J1-1	RX Tip	Twisted Pair #1	<—	RX-Tip
J1-2	RX Ring	Twisted Pair #1	<—	RX-Shield
J1-3	RX Shield	Twisted Pair #3	—	RX-Shield
J1-4	TX Tip	Twisted Pair #2	—>	TX-Tip
J1-5	TX Ring	Twisted Pair #2	—>	TX-Shield
J1-6	TX Shield	Twisted Pair #4	—	TX-Shield

Figure 2-9 RJ-45 to Twinax Interface Cable for 75-Ohm (Unbalanced Connections)

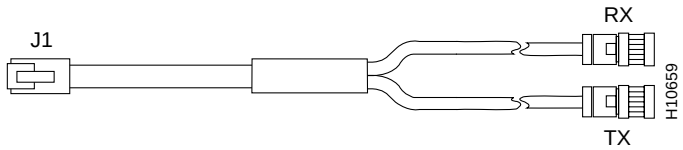


Table 2-12 RJ-45 to Twinax Cable Pinouts

RJ-45 Pin	Signal	Description	Direction	Twinax Pin
Shield	Ground	Shell	—	RX, TX Shields
J1-1	RX Tip	Twisted Pair #1	<—	RX-1
J1-2	RX Ring	Twisted Pair #1	<—	RX-2
J1-3	RX Shield	Twisted Pair #3	—	RX Shield
J1-4	TX Tip	Twisted Pair #2	—>	TX-1
J1-5	TX Ring	Twisted Pair #2	—>	TX-2
J1-6	TX Shield	Twisted Pair #4	—	TX Shield

Figure 2-10 RJ-45 to RJ-45 Interface Cable

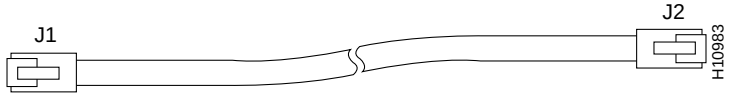


Table 2-13 RJ-45 to RJ-45 TE Cable Pinouts (Straight-through)

RJ-45 Pin	Signal	Description	Direction	RJ-45 TE Pin
Shield	Ground	Shell/Braid	—	Shield
J1-1	RX Tip	Twisted Pair #1	<—	J2-1
J1-2	RX Ring	Twisted Pair #1	<—	J2-2
J1-3	RX Shield	Twisted Pair #3	—	J2-3
J1-4	TX Tip	Twisted Pair #2	—>	J2-4
J1-5	TX Ring	Twisted Pair #2	—>	J2-5
J1-6	TX Shield	Twisted Pair #4	—	J2-6

Table 2-14 RJ-45 to RJ-45 NT Cable Pinouts (Crossover)

RJ-45 Pin	Signal	Description	Direction	Signal	RJ-45 NT Pin
Shield	Ground	Shell/Braid	—	Ground	Shield
J1-1	RX Tip	Twisted Pair #1	<—	TX Tip	J2-4
J1-2	RX Ring	Twisted Pair #1	<—	TX Ring	J2-5
J1-3	RX Shield	Twisted Pair #3	—	TX Shield	J2-6
J1-4	TX Tip	Twisted Pair #2	—>	RX Tip	J2-1
J1-5	TX Ring	Twisted Pair #2	—>	RX Ring	J2-2
J1-6	TX Shield	Twisted Pair #4	—	RX Shield	J2-3

Warning **To avoid electric shock, do not connect safety extra-low voltage (SELV) circuits to telephone network voltage (TNV) circuits. LAN ports contain SELV circuits and WAN ports contain TNV circuits. Some LAN and WAN ports both use RJ-45 connectors. To see translations of the warnings that appear in this publication, refer to the *Regulatory Compliance and Safety Information* that accompanied this device.**

Connecting Trunk Card Cables

The CT1 and CE1 trunk cards provide 12 RJ-45 receptacles for T1 or E1 lines. To connect T1or E1 lines, follow these steps:

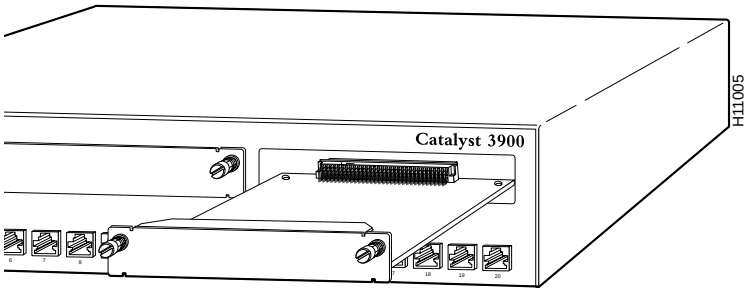
Step 1 Attach the RJ-45 end of the T1 or E1 cable directly to the RJ-45 receptacle on the trunk card. (See Figure 2-11.)

Step 2 For T1 cabling, attach the network end of your CT1 cables to your external network.

Step 3 For E1 cabling, attach the network end of your CE1 cables to your network termination (NT1) device.

Warning **Hazardous network voltages are present in WAN ports regardless of whether power to the unit is OFF or ON. To avoid electric shock, use caution when working near WAN ports. When detaching cables, detach the end away from the unit first. To see translations of the warnings that appear in this publication, refer to the *Regulatory Compliance and Safety Information* that accompanied this device.**

Figure 2-11 CT1 and CE1 Trunk Card RJ-45 Cable Connections



Warning **To avoid electric shock, do not connect safety extra-low voltage (SELV) circuits to telephone network voltage (TNV) circuits. LAN ports contain SELV circuits and WAN ports contain TNV circuits. Some LAN and WAN ports both use RJ-45 connectors. To see translations of the warnings that appear in this publication, refer to the *Regulatory Compliance and Safety Information* that accompanied this device.**

Configuring Cable Length

When you configure your CT1 trunk cards, you must include the length of the cable connected to the card. To specify this length, use the **cablelength** command. No **cablelength** command is required for CE1 trunk cards.

If you change the cable length when installing and cabling a new trunk card, you need to specify cable length in your software configuration. The **cablelength** command is designed to recognize two settings:

- Cable Length Short
- Cable Length Long

Cable Length Short

Cable length short defines the length of the cable (in feet) between your network access server (NAS) and your repeater. The **cablelength short** command includes the following settings:

- 133 feet (0 to 133 feet)
- 266 feet (134 to 266 feet)
- 399 feet (267 to 399 feet)
- 533 feet (400 to 533 feet)
- 655 feet (534 to 655 feet)

Note Although the cable length can range from 0 to 655 feet, the hardware recognizes only fixed lengths. For example, if the cable length between your NAS and your repeater is 50 feet, you should configure your cable length using the 133 feet setting. If you later change the cable length to 200 feet, reconfigure your cable length using the 266 feet setting.

Cable Length Long

Cable length long defines the length range between your NAS and your repeater in gain and pulse. The **cablelength long** command includes the following gain and pulse settings:

- gain 26 (26 db gain)
- gain 36 (36 db gain)
- -15 db (-15 db pulse)
- -22.5 db (-22.5 db pulse)
- -7.5 db (-7.5 db pulse)
- 0 db (0 db pulse)

To configure cable length, you must be in global configuration mode. Table 2-15 lists commands to help you configure your CT1 lines using the **cablelength** command.

Note When you configure your system for CT1 lines, you must also include additional commands to define framing, line code, clock source, signaling, and so forth. For complete instructions on how to configure your trunk card lines, refer to the *Cisco AS5800 Universal Access Server Operation, Administration, Maintenance, and Provisioning Guide* that shipped with your system.

Table 2-15 Configuring Channelized T1 Cable Length

	Command	Description
Step 1	AS5800> **enable** Password: *password* AS5800#	Enter the **enable** command. Enter your password. You are in privileged EXEC mode when the prompt changes to AS5800#.
Step 2	AS5800# **configure terminal** Enter configuration commands, one per line. End with CNTL/Z. AS5800(config)#	Enter global configuration mode by typing the **configure terminal** command. The example uses the terminal configuration option. You are in global configuration mode when the prompt changes to AS5800(config)#.
Step 3	AS5800(config)# **controller t1** shelf/slot/port	Enter controller configuration mode by typing **controller t1** to configure your controller port. The controller ports are labeled *shelf/slot/***0** through *shelf/slot/***11** on the T3 cards.
Step 4	AS5800(config-controller)# **cablelength short 133** [or] AS5800(config-controller)# **cablelength long gain 26**	Enter the controller **cablelength short** value (133, 266, 399, 533, or 655). Enter the controller **cablelength long** value using **gain 26** or **gain 36** and **pulse** (-15, -22.5, -7.5, or 0).

This completes the trunk card installation procedure. To verify the installation, proceed to the following section, “Verifying and Troubleshooting the Installation.”

Verifying and Troubleshooting the Installation

When you first power ON your Cisco AS5800 access server, all LEDs light while the system runs a series of diagnostics. After the system passes initial diagnostics, all LEDs go off. The LEDs then light again as described in Table 2-1.

To complete the installation, verify that the trunk card LEDs operate properly by observing the following LED states:

- The power LED is ON.

  If the power LED remains OFF, verify that the card is seated properly.

  If the power LED lights on other trunk cards in the dial shelf, try inserting the trunk card in a different slot. If none of the power LEDs lights, check your dial shelf power connections, power entry modules, and AC-input power supplies (if present).

- The HCPU LED is ON.

  If the HCPU LED is OFF but the power LED is ON, the software image might have failed to load onto the card. The dial shelf controller attempts to reload the software automatically. After a programmed number of attempts to reload the software image fails, the dial shelf controller powers OFF the trunk card and all LEDs shut off.

  If this happens, assume that the failure is due to defective hardware. Return the card to the factory for replacement. For information on how to contact Cisco, see the "Obtaining Documentation" section on page xiv.

- The FCPU LED is ON.

  If the FCPU LED is OFF while the HCPU LED is ON, either the hardware is defective or the framer processor software has crashed. To determine if the failure is software related, wait while the auto-reload feature on the dial shelf controller card attempts to reload the software image. If the software fails to reload after the programmed number of times, assume that the failure is due to defective hardware. Return the card to the factory for replacement.

Tips For further installation troubleshooting information, refer to the *Cisco AS5800 Universal Access Server Hardware Installation Guide*.

Configuring the CT1 and CE1 Trunk Card

The Cisco 5814 dial shelf recognizes CT1 and CE1 trunk cards only in slots 0 to 5 within the dial shelf chassis. Therefore, install trunk cards only in one of the first six slots.

If you are replacing a dial shelf card by installing a new dial shelf card of the same type in the same slot, the system software recognizes the new dial shelf card interfaces and brings them up automatically. No additional configuration is needed.

If you are installing a trunk card in a different slot than the trunk card that you just removed, additional configuration is needed. Refer to the *Cisco AS5800 Universal Access Server Operation, Administration, Maintenance, and Provisioning Guide* to configure the CT1 and CE1 interfaces.

CHAPTER 3

Channelized T3 Trunk Card

The Cisco AS5800 universal access server supports a channelized T3 (CT3) ingress interface that provides asynchronous aggregation of channelized interfaces and multiplexing on a single T3 facility. The CT1/CE1 trunk card is installed in the Cisco 5814 dial shelf chassis in slots 0 to slot 5. The Cisco AS5800 currently supports as many as two CT1/CE1 trunk cards.

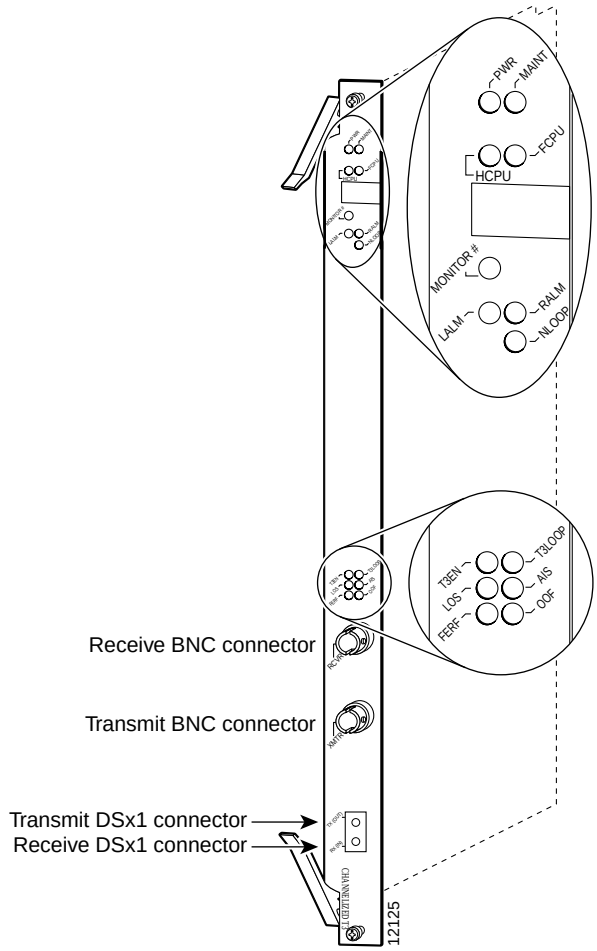
This chapter explains how to remove and replace a CT1/CE1 trunk card in the Cisco 5814 dial shelf chassis, and also includes steps for verifying and troubleshooting your trunk card installation and configuring your software.

CT1/CE1 Trunk Card Overview

The CT1/CE1 trunk card contains an onboard M13 multiplexer, which multiplexes 28 separate T1 lines into a single T3 line. Each CT1/CE1 trunk card installed in the Cisco 5814 dial shelf contains all necessary functionality to terminate link signaling and incoming digital calls.

Figure 3-1 shows the CT1/CE1 trunk card.

Figure 3-1 CT1/CE1 Trunk Card



Each CT1/CE1 trunk card performs the following functions:

- Provides physical termination for as many as 672 sessions.
- Provides digital termination for as many as 256 DS0 connections (calls) using onboard High-Level Data Link Control (HDLC) controllers. Note that the D-channel of a PRI consumes a single channel of an HDLC controller.
- Removes framing and embedded signaling bits (or inserts them, depending on the direction of the flow), demultiplexing the calls. The framer CPU sends the data stream to onboard time-division multiplexing (TDM) resources, which break out each call and pass each call to an appropriate call termination resource. Digital or ISDN-originated calls are terminated onboard the CT1/CE1 trunk card on HDLC controllers.

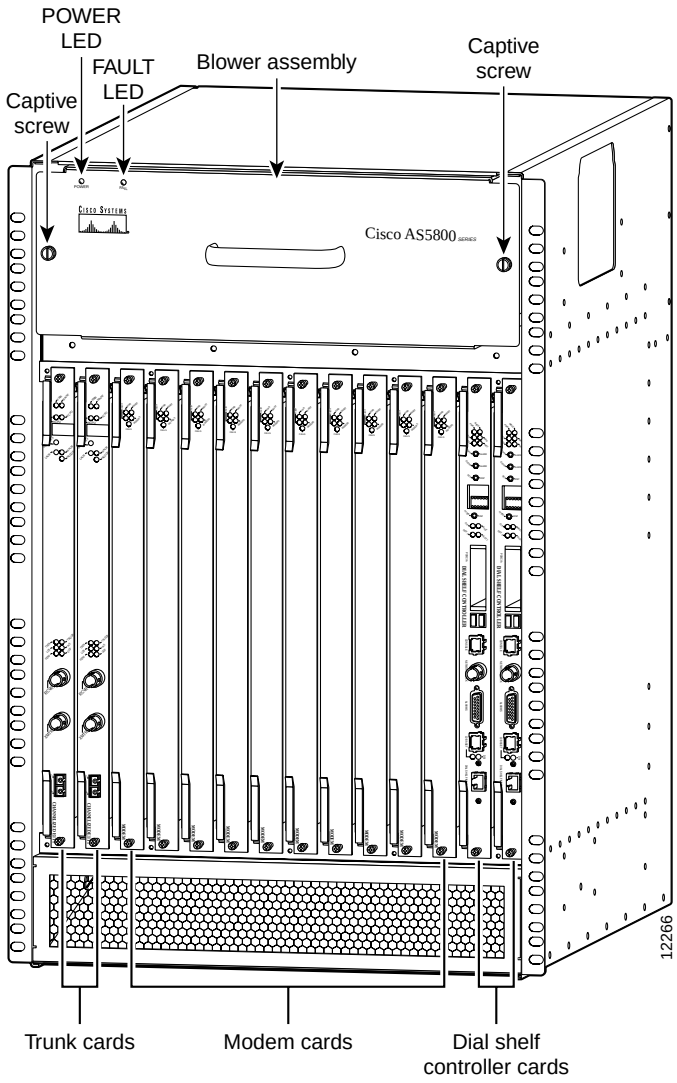
  Note Each D-channel consumes an HDLC controller.

  Analog modem-originated calls are passed over the dial shelf backplane TDM bus to an available modem resource. The system software controls modem and HDLC resource management.
- Responds to time-sensitive signaling. Each CT1/CE1 trunk card can supply two clocks from any two of its 28 ports. You can assign priorities to these clocks or accept the default values assigned by the software.

- Processes counting information for performance monitoring.
- Supports online insertion and removal (OIR), a feature that allows you to remove and replace a trunk card in the Cisco 5814 dial shelf while the system is operating without disrupting other cards and their associated calls. If you remove a trunk card while the system is operating, all calls associated with the CT3 lines on that card are dropped. Calls being handled by other trunk or modem cards, however, are not affected. For more information, see the "Online Insertion and Removal" section on page 1-1.

Figure 3-2 shows two trunk cards installed in a fully-configured Cisco 5814 dial shelf chassis.

Figure 3-2 Cisco 5814 Dial Shelf Chassis Fully Configured with Trunk Cards Installed



Clocking

All Cisco AS5800 access server trunk cards use the same transmit clock. This clock can originate from the following sources:

- TDM clock source—A priority value from 1 to 50 that is applied to a clock source when multiple clock sources are used
- External clock source—A clock source external to the access server

Clocks are prioritized by slot number (slots 0 to 5). The highest-priority clock is selected from the card in slot 0 and used as the default clock. If this clock fails, the highest-priority clock from the card in slot 1 becomes the default clock, and so forth.

The trunk card then forwards the clocks to the dial shelf controller. The dial shelf controller selects the highest-priority clock as the system primary clock, and the rest of the clocks remain in a prioritized backup queue.

Instead of using the default algorithm for clock selection, you can specify clocks through global configuration and select a maximum of two clocks per trunk card.

If you configure fewer than two clocks on a trunk card and all other configured clocks fail, clock selection resorts to the default algorithm on that card and the second clock will be selected automatically.

CT3 Clocking

CT1/CE1 trunk cards are usually attached to an external device, such as a Digital Access and Crossconnect System (DACS) or Add-Drop Multiplexer (ADM). This point-to-point link requires a single clock source to which the CT3 link is timed. You must determine whether you want the CT1/CE1 trunk card or an external device to be used as the primary clock source and configure it accordingly during the software configuration process, which is discussed in the "Configuration Commands" section on page 3-12.

CT1 Clocking

The CT1/CE1 trunk card has 28 T1 framers that always get their clock from the line. As a result, configuration of T1 clock sources is not allowed.

LED and Alphanumeric Indicators

The CT1/CE1 trunk card front panel is designed with LED and alphanumeric displays to provide trunk card status. (See Figure 3-3.)

Figure 3-3 CT1/CE1 Trunk Card Front Panel LED and Alphanumeric Indicators

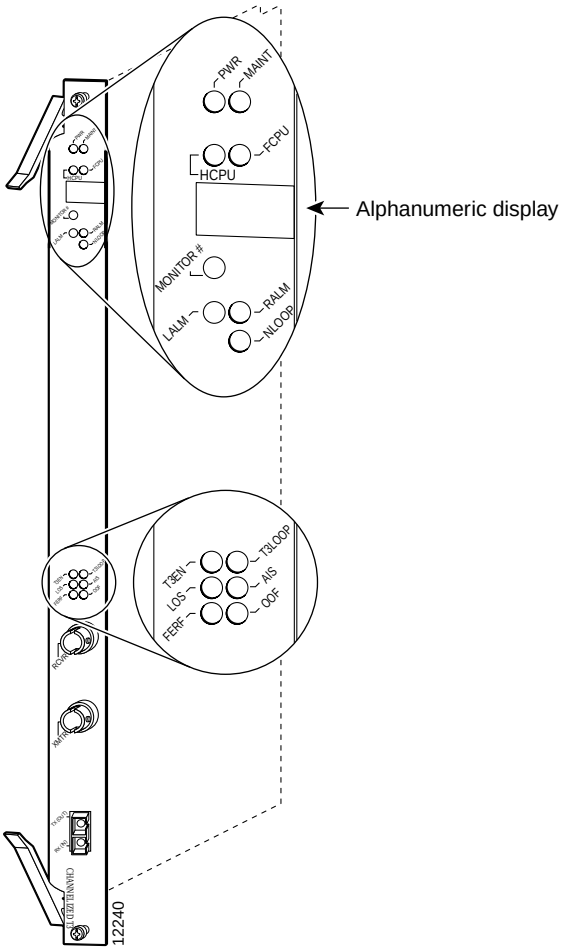


Table 3-1 lists the CT1/CE1 trunk card LEDs and their functions.

Table 3-1 CT1/CE1 Trunk Card LED Indicators

LED	Color	Description
PWR	Green	Power—Lights when power is ON.
MAINT	Yellow	Maintenance—Lights to indicate that the feature card is ready for OIR.
HCPU	Green	Host CPU—Lights when the associated host CPU is determined to be in good working condition; shuts off when there is an error condition or code is being downloaded.
FCPU	Green	Framing data link—Lights when the associated FDL CPU is determined to be in good working condition; shuts off when there is an error condition or code is being downloaded.
LALM	Yellow	Local alarm—Lights to indicate a T1 alarm condition was encountered by software for a particular port; remains OFF when the operating condition is normal.

Table 3-1 CT1/CE1 Trunk Card LED Indicators (continued)

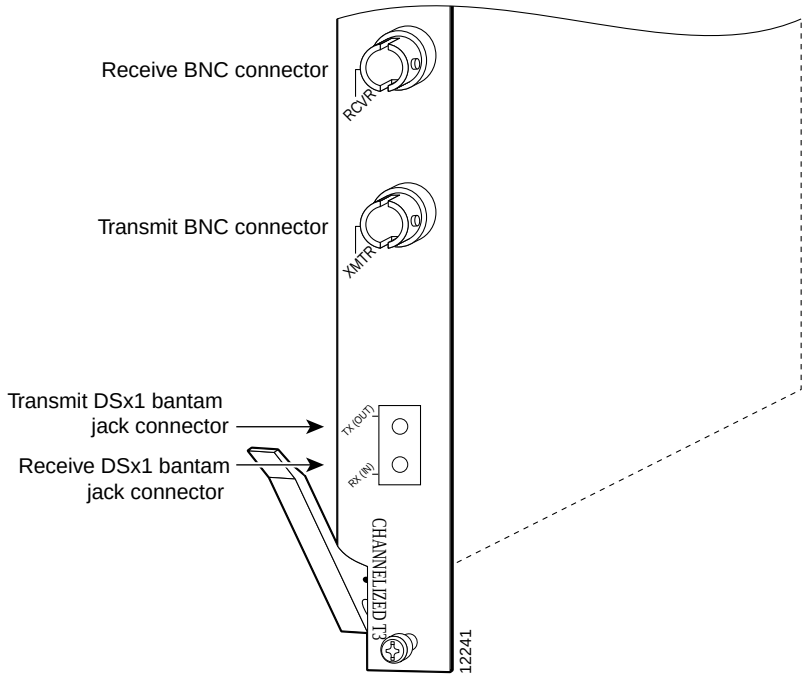
LED	Color	Description
RALM	Yellow	Remote alarm—Lights to indicate a T1 alarm condition was encountered by software for a particular port; remains OFF when the operating condition is normal.
NLOOP	Yellow	Network loop—Lights to indicate that at least one T1 is unavailable (status indicator); remains OFF when the operating condition is normal.
T3EN	Green[1]	Enable—Lights to indicate a CT3 card line connection enabling normal operation.
T3LOOP[2]	Yellow[3]	Loopback—Lights to indicate that a loopback condition exists on the CT3 line; software controlled.
LOS	Yellow[3]	Loss-of-signal—Lights to indicate that the CT3 framer is experiencing a loss of signal (175 successive zeros).
AIS	Yellow[3]	Alarm indication signal—Lights to indicate the presence of AIS in the received CT3 line. Lights to indicate that a T3 alarm condition exists; remains OFF when the operating condition is normal.
FERF	Yellow[3]	Far-end receive failure—Lights to indicate a far-end receive failure on the CT3 line.
OOF	Yellow[3]	Out-of-frame—Lights to indicate an out-of-frame condition on the CT3 line.

1. This LED must be lit for proper CT3 operation.
2. When in loopback mode, enables diagnostics to perform local CT3 testing without external support. The CT3 line is not affected by this condition, thus remaining disconnected and open.
3. This LED must remain off for proper CT3 operation.

Trunk Card Connectors

The CT3 front panel is designed with two types of cable connectors (see Figure 3-4). The BNC connectors are used to connect the cables carrying the T3 signals. The bantam jacks are used for local BERT circuit testing to the DS1 level.

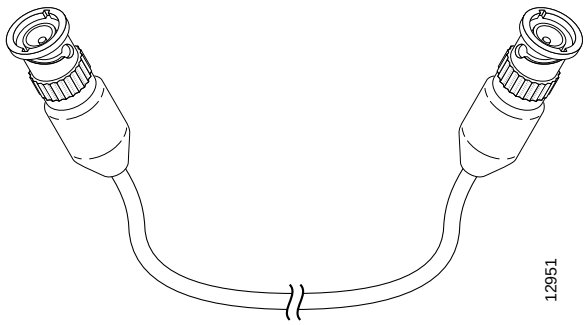
Figure 3-4 CT1/CE1 Trunk Card Front Panel Connectors



Cables

The CT1/CE1 trunk card receives and transmits 45 Mbps signals through a 75-ohm cable, using common BNC coaxial cable connectors (see Figure 3-5). There are two female BNC connectors: one for T3 transmit data and one for T3 receive data.

Figure 3-5 CT3 75-Ohm Coaxial Cable



Using the Test Port

The CT3 trunk card front panel is designed with an alphanumeric display to provide trunk card status and port monitoring information (see Figure 3-3).

Test-port functionality is supported by Cisco IOS Release 12.0(6)T and later releases.

Trunk Card Bantam Jacks

The test port is a set of bantam jack connectors located at the bottom of the CT3 front panel (see Figure 3-4). The bantam jacks allow the connection of an external test device (for example, a FIREBERD test device) to test any of the 28 individual T1 circuits in drop-and-insert mode or to monitor an individual T1 circuit in monitor mode.

- In drop-and-insert mode, the T1 line is dropped out of service. To prevent accidental use of the push button in drop-and-insert mode, use the **test trunk drop-insert** privileged EXEC command to disable the drop-and-insert mode on the specified T3 controller.
- In monitor mode, you can monitor only the ingress side of the T1 line. The T1 line being monitored is not disrupted, and the line maintains its HDLC and modem connections through TDM.

Drop-and-Insert Mode

The **test trunk drop-insert** privileged EXEC command is used to enable or disable drop-and-insert mode on a T3 controller. When the system initially boots up, the drop-and-insert mode is disabled on all T3 controllers.

To drop a particular T1 line to the test port, follow these steps:

Step 1 Enable drop-and-insert mode by entering the **test trunk drop-insert on** privileged EXEC command as follows:

```
AS5800# test trunk drop-insert on shelf/slot/unit
```

Note The *shelf/slot/unit* identifies the T1 to the CT3 controller.

Step 2 Push and quickly release the push button below the LED to toggle to the port number. The push button is labeled “MONITOR #” in Figure 3-3.

Note You must release the push button within 2 seconds to advance through the port numbers (from 1 to 28). After port 28, the display returns to port 1.

Step 3 Push and hold the push button for two or more seconds.

The letter “D” (indicating drop-insert) is displayed in the front panel LED, indicating that the particular T1 line has been dropped to the test port.

Note To select another port number, press the push button again and hold it for two or more seconds. You can now toggle to another port number.

Step 4 Disable the drop-and-insert mode after testing the T1 lines. We recommend that you disable drop-and-insert mode to prevent accidental use of the push button on the CT3 board.

To disable drop-and-insert mode, enter the **test trunk drop-insert off** privileged EXEC command as follows:

```
AS5800# test trunk drop-insert off shelf/slot/unit
```

Monitor Mode

To monitor a particular T1 line at the test port, follow these steps:

Step 1 Verify that drop-and-insert mode is disabled on the CT3 controller by entering the **show** command, as follows:

```
AS5800# sh controller t3 shelf/slot/unit
```

The following is sample output from the **sh controller t3** command if drop-and-insert mode is disabled:

```
AS5800# show controller t3 1/1/0
T3 1/1/0 is up.
Applique type is Channelized T3
No alarms detected.
FEAC code received: No code is being received
Framing is M23, Line Code B3ZS, Clock Source is Internal
Drop-insert is disabled
Data in current interval (90 seconds elapsed):
 0 Line Code Violations, 0 P-bit Coding Violation
 0 C-bit Coding Violation, 0 P-bit Err Secs
 0 P-bit Severely Err Secs, 0 Severely Err Framing Secs
 0 Unavailable Secs, 0 Line Errored Secs
 0 C-bit Errored Secs, 0 C-bit Severely Errored Secs
AS5800#
```

Note If the display shows `Drop-insert is enabled`, repeat Step 4 in the "Drop-and-Insert Mode" section on page 3-8.

Step 2 Push and quickly release the push button below the LED to toggle to the port number. The push button is labeled "MONITOR #" in Figure 3-3.

Note You must release the push button within two seconds to advance through the port numbers (from 1 to 28). After port 28, the display returns to port 1.

Step 3 Push and hold the push button for two or more seconds.

The letter "M" (indicating monitor) is shown in the front panel display, indicating that you can monitor the particular T1 line at the test port.

Note To select another port number, press the push button again and hold it for two or more seconds. You can now toggle to another port number.

Specifications

Table 3-2 lists the CT1/CE1 trunk card specifications.

Table 3-2 CT1/CE1 Trunk Card Specifications

Description	Specification
Dimensions H x W x L	15.4 x 0.08 x 18.7 in. (39.12 x 0.203 x 47.5 cm) without the carrier 15.5 x 1.23 x 19 in. (39.37 x 3.12 x 48.26 cm) with the carrier
Weight	8 lb (3.6 kg)
Transmission bit rate	44,736 Mbps
MTBF[1]	Exceeds 50,000 hr
Power requirements	+3.3 VDC, 8A, ±5% +5.0 VDC, 15A, ± 5%
Regulatory compliance	Safety: UL 1950, CSA 22.2 No. 950, EN60950, AUSTEL TS001, AS/NZS 3260, IEC 950 Emissions: CFR 47 Part 15 Class B(FCC), CISPR22 Class B, EN55022 Class B, AS/NRZ 3548 Class B, ICES003, VCCI Class B Immunity: IEC 1000-3-2, IEC 1000-3-3, IEC-1000-4-2, IEC-1000-4-3, IEC-1000-4-4, IEC-1000-4-5, IEC-1000-4-6, IEC-1000-4-11, EN50082-1, EN50082-2 For additional compliance information, refer to the *Regulatory Compliance and Safety Information* document that accompanied this device.

1. MTBF = Mean time between failures.

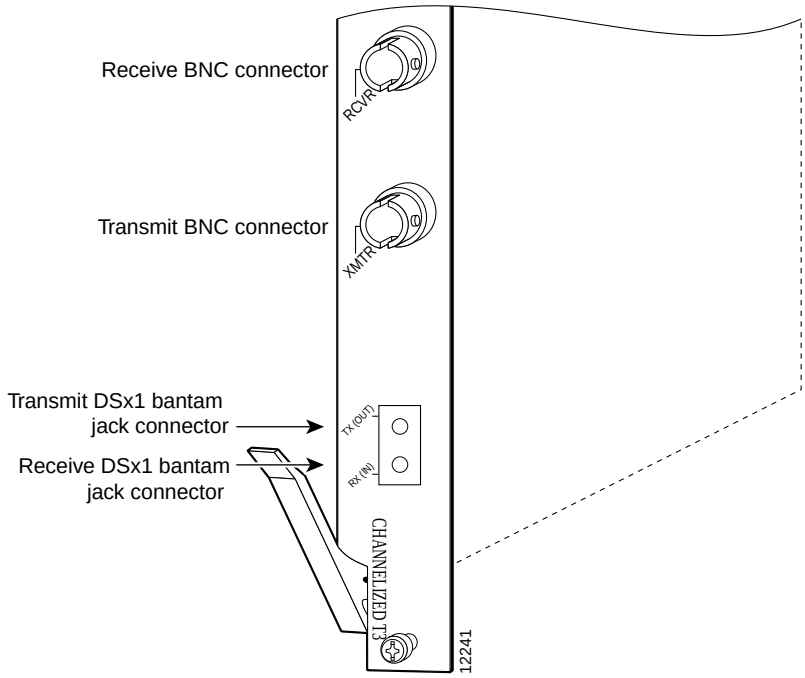
Connecting Trunk Card Cables

The CT1/CE1 trunk card receives and transmits 45-Mbps signals through a 75-ohm cable, using common female BNC coaxial cable connectors. There are two female BNC connectors: one for T3 transmit data and one for T3 receive data. Use a 75-ohm coaxial cable to connect the T3 lines (see Figure 3-5).

To connect the T3 lines, follow these steps:

Step 1 Attach the end of the T3 cable directly to the BNC receptacle on the trunk card (see Figure 3-6).

Figure 3-6 CT1/CE1 Trunk Card BNC Cable Connections



Step 2 Attach the network end of your CT3 cable to your external network.

Configuring Cable Length

When you configure your CT1/CE1 trunk cards, you must include the length of the cable connected to the card. To specify this length, use the **cablelength** command and designate the length of the DS3 cable, as shown in Table 3-3. Cable length is a number of feet from 0 to 450.

When you configure your system for CT3 lines, you must also include additional commands to define framing, line code, clock source, signaling, and so forth. For additional software information, refer to the *Cisco AS5800 Universal Access Server Operation, Administration, Maintenance, and Provisioning Guide* that shipped with your system.

This completes the trunk card installation procedure. To verify the installation, proceed to the following section "Verifying and Troubleshooting the Installation."

Verifying and Troubleshooting the Installation

When you first power ON your Cisco AS5800, all LEDs light while the system runs a series of diagnostics. After the system passes initial diagnostics, all LEDs shut off. The LEDs then light again as described in Table 3-1.

To complete the hardware installation, verify that the trunk card LEDs operate properly by observing the following LED states:

- The power LED is ON.

  If the power LED remains OFF, verify that the card is seated properly.

  If the power LED lights on other trunk cards in the dial shelf, try inserting the trunk card in a different slot. If none of the power LEDs lights, check your dial shelf power connections, power entry modules, and AC-input power supplies (if present).

- The HCPU LED is ON.

  If the HCPU LED is OFF but the power LED is ON, the software image might have failed to load onto the card. The dial shelf controller attempts to reload the software automatically. After a programmed number of attempts to reload the software image fails, the dial shelf controller powers OFF the trunk card and all LEDs are shut off.

  If this happens, assume that the failure is due to defective hardware. Return the card to the factory for replacement. For information on how to contact Cisco, see the "Obtaining Documentation" section on page xiv.

- The FCPU LED is ON.

  If the FCPU LED is OFF while the HCPU LED is ON, either the hardware is defective or the framer processor software has crashed. To determine if the failure is software related, wait while the auto-reload feature on the dial shelf controller card attempts to reload the software image. If the software fails to reload after the programmed number of times, assume that the failure is due to defective hardware. Return the card to the factory for replacement.

Tips For further installation troubleshooting information, refer to the *Cisco AS5800 Universal Access Server Hardware Installation Guide*.

Configuring the CT1/CE1 Trunk Card

The Cisco 5814 dial shelf recognizes trunk cards only in dial shelf slots 0 to 5. Therefore, install trunk cards only in the first six slots.

If you are replacing a dial shelf card by installing a new dial shelf card of the same type in the same slot, the system software recognizes the new dial shelf card interfaces and brings them up automatically. No additional configuration is needed.

If you are installing a trunk card in a different slot than the trunk card you just removed, additional configuration is needed. Refer to the *Cisco AS5800 Universal Access Server Operation, Administration, Maintenance, and Provisioning Guide* that shipped with your system.

Configuration Commands

Table 3-3 lists commands to help you configure your CT3 card.

Note The / symbol is used in commands to specify a physical location. Thus 1/0/0 on a T3 port tells you where you can plug something in to the dial shelf. The : symbol is used in commands to specify a TDM channel within a physical port.

Table 3-3 T3 Configuration Commands

	Command	Description

Step 1	`AS5800> enable`
	`Password: password`
	`AS5800#`
		Enter the **enable** command.
		Enter your password.
		You are in privileged EXEC mode when the prompt changes to `AS5800#`.

Step 2	`AS5800# configure terminal`
	`Enter configuration commands, one per line. End with CNTL/Z.`
	`AS5800(config)#`
		Enter global configuration mode by entering the **configure terminal** command. The example uses the terminal configuration option.
		You are in global configuration mode when the prompt changes to `AS5800(config)#`.

Step 3	`AS5800(config)# interface loopback 0` `%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0, changed state to up`	Enter **interface loopback 0** to create interface loopback 0, which is the logical IP subnet containing all dial-in user addresses. You are in interface mode when the prompt changes to `AS5800(config-if)#`.
Step 4	`AS5800(config-if)# loopback local`	Set the normal data path back to its source (either *local* or *network*).
Step 5	`AS5800(config-if)# no shutdown`	Enable the interface using the **no shutdown** command.[1]
Step 6	`AS5800(config)# controller t3 shelf/slot/0`	Enter controller configuration mode to configure your T3 controller port. The only legal port value is 0.
Step 7	`AS5800(config-controller)# t3 description ascii-string`	Enter an optional text description for the T3 controller.
Step 8	`AS5800(config-controller)# cablelength 200`	Enter the controller **cablelength** value, from **0** to **450** (feet).
Step 9	`AS5800(config-controller)# framing c-bit`	Enter the type of T3 framing used. *C-bit* specifies C-bit parity framing. *M23* (default) specifies M23 multiplexer framing.
Step 10	`AS5800(config-controller)# t1 ds1 controller`	Create a logical T1 controller from each of the specified T3 line time slots. The entry *ds1* is a time slot within the T3 line with a value from **1** to **28**.
Step 11	`AS5800(config)# controller t1 shelf/slot/port:t1-num`	Enter controller configuration mode to configure your T3 controller port. *T1-num* is a T1 timeslot within the T3 line with a value from **1** to **28**.
Step 12	`AS5800(config-controller)# clock source line`	Configure the clock source as an internal clock (*internal*) or a recovered clock (*line*).

Table 3-3 T3 Configuration Commands (continued)

	Command	Description
Step 13	AS5800(config)# **dial-tdm-clock priority** {*1-50*} {*external	trunk-slot*} {*0-5*} **ds3-port 0 port** {*1-28*}	Configure clock priority, which is a value from **1** to **50**. Select a clocking source by selecting an *external* reference clock or a *trunk card*. If you are using an external reference clock, no other CLI is needed. If you are using a trunk card, select a dial shelf slot from **0** to **5**. Select the T3 port number, which has a value of **0**.
Step 14	AS5800# **copy running-config startup-config**	Save your changes when ready.

1. To deactivate a command functionality, type **no** before the command.

To verify your software configuration, you can enter **show** commands to display clock (**show dial-shelf clock**) and controller (**show controller t3**) settings. To enter **show** commands, you must be in privileged EXEC mode. Some examples:

```
AS5800# show dial-shelf clock
Primary Clock:
--------------
Slot 12:
System primary is 1/1/0:2 of priority 213
TDM Bus Master Clock Generator State = NORMAL

Backup clocks:
Source  Slot  Port  DS3-Port  Priority      Status      State
-----------------------------------------------------------------
Trunk   0     1       0        206          Bad         Default
Trunk   0     2       0        212          Bad         Default
Trunk   1     4       0        225          Good        Default

Status of trunk clocks:
-----------------------

      Ds3         2 2 2 2 2 2 2 2 1 1 1 1 1 1 1 1 1
Slot  Port  Type  8 7 6 5 4 3 2 1 0 9 8 7 6 5 4 3 2 1 0 9 8 7 6 5 4 3 2 1
0     0     T3    G G G G G G G G G G G G G G G G G G G G G G G G G G G G
1     0     T3    B B B B B B B B B B B B B B B B B B B G G G G G G G G
```

```
AS5800# show controller t3
T3 1/0/0 is up.
  Applique type is Channelized T3
  No alarms detected.
  FEAC code received: No code is being received
  Framing is M23, Line Code is B3ZS, Clock Source is Line.
  Data in current interval (751 seconds elapsed):
     0 Line Code Violations, 0 P-bit Coding Violation
     0 C-bit Coding Violation, 0 P-bit Err Secs
     0 P-bit Severely Err Secs, 0 Severely Err Framing Secs
     0 Unavailable Secs, 0 Line Errored Secs
     0 C-bit Errored Secs, 0 C-bit Severely Errored Secs
  Total Data (last 16 15 minute intervals):
     34989 Line Code Violations, 16414 P-bit Coding Violation,
     49331 C-bit Coding Violation, 0 P-bit Err Secs,
     0 P-bit Severely Err Secs, 0 Severely Err Framing Secs,
     12 Unavailable Secs, 0 Line Errored Secs,
     10 C-bit Errored Secs, 10 C-bit Severely Errored Secs

T3 1/1/0 is up.
  Applique type is Channelized T3
  No alarms detected.
  FEAC code received: No code is being received
  Framing is M23, Line Code is B3ZS, Clock Source is Line.
  Data in current interval (751 seconds elapsed):
     0 Line Code Violations, 0 P-bit Coding Violation
     0 C-bit Coding Violation, 0 P-bit Err Secs
     0 P-bit Severely Err Secs, 0 Severely Err Framing Secs
     0 Unavailable Secs, 0 Line Errored Secs
     0 C-bit Errored Secs, 0 C-bit Severely Errored Secs
  Total Data (last 16 15 minute intervals):
     42579 Line Code Violations, 16421 P-bit Coding Violation,
     49208 C-bit Coding Violation, 0 P-bit Err Secs,
     0 P-bit Severely Err Secs, 0 Severely Err Framing Secs,
     2 Unavailable Secs, 0 Line Errored Secs,
     10 C-bit Errored Secs, 10 C-bit Severely Errored Secs
```

A typical T3 controller configuration in a running-configuration file appears as follows:

```
T3 controller configuration:
----------------------------
controller T3 1/0/0
 framing m23
 clock source line
 cablelength 224
 t1 1 controller
 t1 2 controller
 t1 3 controller
 t1 4 controller
 t1 5 controller
 t1 6 controller
 t1 7 controller
 t1 8 controller
 t1 9 controller
 t1 10 controller
 t1 11 controller
 t1 12 controller
 t1 13 controller
 t1 14 controller
 t1 15 controller
 t1 16 controller
 t1 17 controller
 t1 18 controller
 t1 19 controller
 t1 20 controller
 t1 21 controller
 t1 22 controller
 t1 23 controller
 t1 24 controller
 t1 25 controller
 t1 26 controller
 t1 27 controller
 t1 28 controller
```

A typical T1 controller configuration appears as follows:

```
T1 controller configuration:
----------------------------
controller T1 1/0/0:1
framing esf
pri-group timeslots 1-24
controller T1 1/0/0:2
channel-group 0 timeslots 1-24
            .
            .
            .
controller T1 1/1/0:28
cas-group 0 timeslots 1-24
```

Double-Density Modem Card

The Cisco AS5800 universal access server uses the Cisco Modem ISDN Channel Aggregation (MICA) double-density modem module cards (DMMs) to convert analog pulse-code modulation (PCM) bitstreams to digital data.

This chapter discusses the use of the double-density modem card in the Cisco 5814 dial shelf, the LEDs on the front of the card, the firmware that is used, and also includes steps for configuring your software and verifying and troubleshooting your DMM installation.

CT1/CE1 Trunk Card Overview

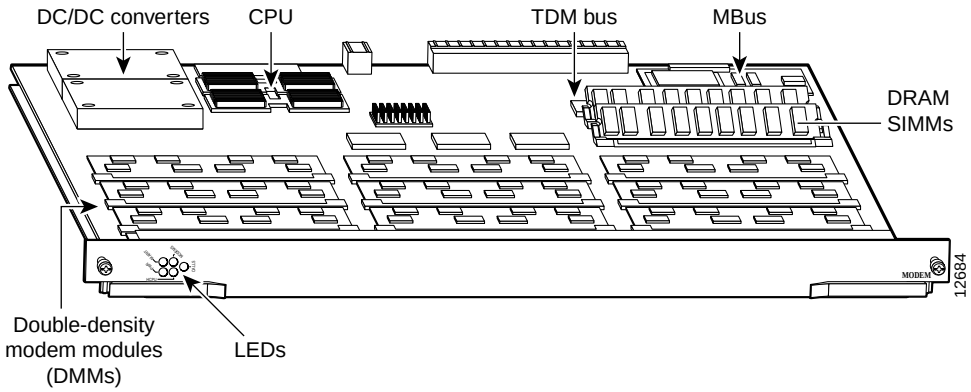
The Cisco AS5800 accommodates a maximum of ten CT1/CE1 trunk cards that use Cisco's MICA technology with upgradable firmware. Each CT1/CE1 trunk card plugs directly into the dial shelf backplane and has no external connections. Each CT1/CE1 trunk card has five LEDs, which indicate modem card status.

The Cisco AS5800 is capable of terminating as many as 1,344 modem connections when equipped with ten CT1/CE1 trunk cards and two CT3 trunk cards.

Each double-density modem card contains 12 DMM SIMMS. Each DMM SIMM contains 12 digital modems.

Figure 4-1 shows the double-density modem card components.

Figure 4-1 Double-Density Modem Card Components



The double-density modem card performs the following functions:

- Converts PCM bitstreams to digital data.

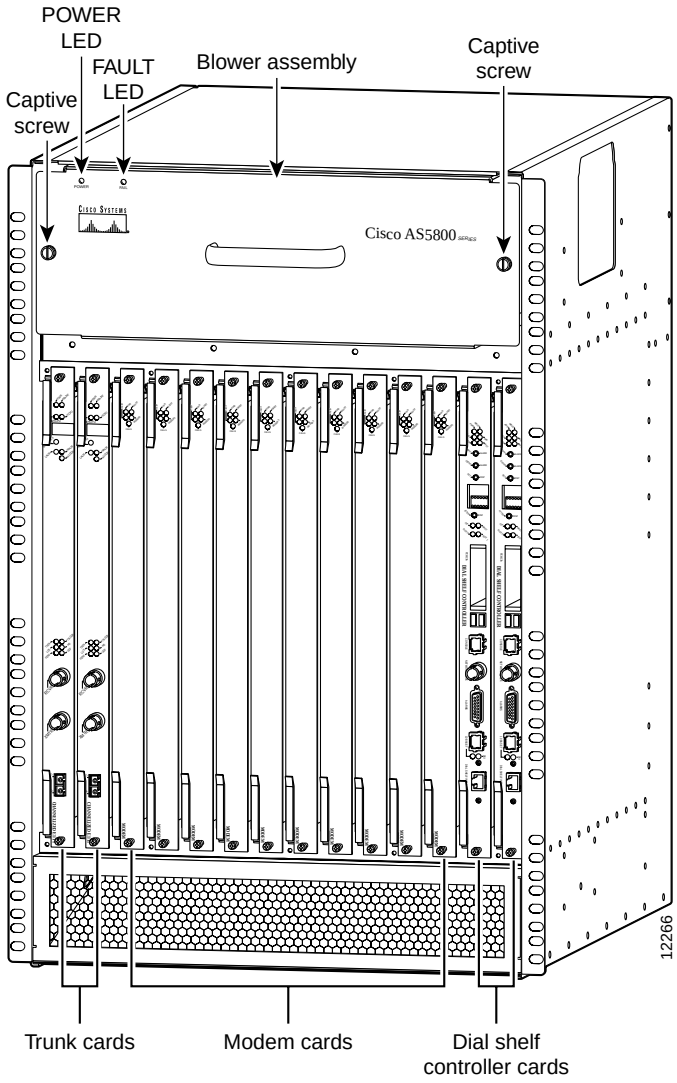
  DMMs perform the modulation and demodulation of the analog bitstreams. Each DMM comprises 12 digital modems. There are 12 DMMs on each DMM modem card; thus, each card can support a maximum of 144 modems.

- Forwards converted and packetized data to the dial shelf main processor, which examines the data and forwards it to the router shelf. From the router shelf, the data is routed to the external network.
- Supports all modem standards (such as V.34 and V.42*bis*) and features, including dial-in and dial-out.
- Supports online insertion and removal (OIR), a feature that allows you to remove and replace CT1/CE1 trunk cards while the system is operating. CT1/CE1 trunk cards can be removed without disrupting the operation of other modem cards and their associated calls. If a CT1/CE1 trunk card is removed while the system is operating, connections or current calls on that card are dropped. Calls being handled by other cards, however, are not affected.

CT1/CE1 trunk cards can be installed in slots numbered 0 to 11 on the dial shelf backplane. However, we recommend that you install modem cards in dial shelf slots 2 to 11 and reserve slots 0 and 1 for trunk cards. (Trunk cards are required for call termination and can only operate in slots 0 to 5.)

Figure 4-2 shows a fully-configured Cisco 5814 dial shelf with ten modem cards installed.

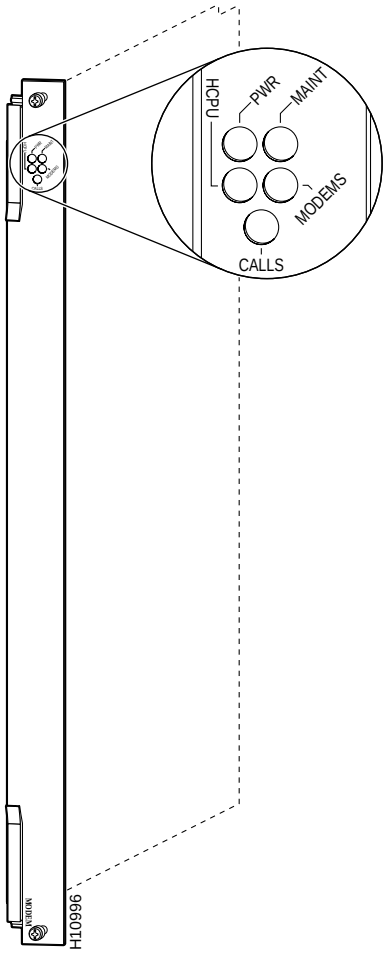
Figure 4-2 Cisco 5814 Dial Shelf with CT1/CE1 Trunk Cards Installed



LED Indicators

The DMM card has five LEDs to indicate modem card status. See Figure 4-3.

Figure 4-3 Double-Density Modem Card Front Panel LEDs



During normal operation, all five LEDs light when the system is powered ON and the CT1/CE1 trunk cards are ready. When the modem card CPU software image starts running, it shuts off all LEDs except the power LED. CT1/CE1 trunk card LEDs are listed in Table 4-1.

Table 4-1 CT1/CE1 Trunk Card LED Descriptions

LED	Color	Description
PWR (Power)	Green	Lights when card is powered ON.
Maint (Maintenance)	Yellow	Lights when there are no active calls on the card and you have completed a card-level software busyout. This indicates that the card is ready to be removed.
HCPU (Host CPU)	Green	Lights when the CT1/CE1 trunk card passes diagnostics and the modem card CPU is operating properly.
Modems	Green	Lights when all modem modules have passed diagnostics and are operating properly. Remains OFF if one or more modem modules are missing from the card or if one or more modems fails diagnostics.
Calls	Green	Lights when at least one active call is switched through the modem card.

Modem Firmware

Modem card software is automatically downloaded to a modem card from the router shelf when you boot the system for the first time, or when you insert a modem card while the system is operating. If you insert modem cards while the system is operating, the system software recognizes the cards and the router shelf downloads the required portware to the cards.

The modem firmware image (also known as *portware*) is bundled with the Cisco IOS modem card image. The firmware image uses an *auto-detect* mechanism, which enables the modem to service multiple modem call types. A modem detects the call type and automatically configures itself for that operation.

The DMM modems can be programmed to collect ANI (calling number) and DNIS (called number) digits for caller identification information when the trunk cards are configured in channel-associated signaling (CAS) mode. The modem passes the ANI/DNIS information to the DMM card software using a portware mailbox message.

The CT1/CE1 trunk cards support the modem standards and features listed in Table 4-2.

Table 4-2 Modem Standards and Supported Features

Feature	Description
Carrier protocols	ITU V.23 at 75/1,200 bps
	Telcordia Technologies (formerly Bellcore) 103 at 300 bps
	ITU V.21 at 300 bps
	ITU V.22 at 1,200 bps
	Telcordia Technologies (formerly Bellcore) 212A at 1,200 bps
	ITU V.22*bis* at 2,400 bps
	ITU V.32 up to 9,600 bps
	ITU V.32*bis* up to 14,400 bps
	V.32 turbo up to 19,200 bps
	V.FC up to 28,800 bps
	V.34 up to 28,800 bps
	V.34+ up to 33,600 bps
	TIA/ITU 56K up to 56,000 bps (when standardized)
	K56flex
Error-correcting link-access protocols	V.42 LAPM, MNP 2-4
Compression protocols	V.42*bis* (includes MNP 5)
Command interface	Superset of the AT command set
In-band signaling/tone generation and detection	DTMF generation
	DTMF detection
	MF generation
	MF detection
Other	Out-of-band access for management
	PPP and SLIP framing

Verifying and Troubleshooting the Installation

During normal operation, all five CT1/CE1 trunk card LEDs light when the modem card is powered ON. When the modem card CPU software starts running, it shuts off all LEDs except the power LED. The LEDs then light again as described in Table 4-1.

To complete the installation, verify that the CT1/CE1 trunk card LEDs operate properly by observing the following LED states:

- The power LED is ON.

  If the power LED remains OFF, verify that the card is seated properly.

  If the power LED lights on other modem cards in the dial shelf, try inserting the CT1/CE1 trunk card in a different slot. If none of the power LEDs light, check your dial shelf power connections, power entry modules, and AC-input power supplies (if present).

- The HCPU LED is ON.

  If the HCPU LED lights, the CT1/CE1 trunk card has passed diagnostics and the system software is up and running.

  If the HCPU LED is OFF but the power LED is ON, the software image might have failed to load onto the card. The dial shelf controller attempts to reload the software automatically. If a programmed number of attempts to reload the software image fails, the dial shelf controller will power OFF the CT1/CE1 trunk card and the HCPU light will shut off.

  Verify that the other cards in the dial shelf work properly. Verify that the card is seated properly. Try inserting the card in a different slot. Verify that you are using the correct software image by using the **show modem version** command.

- The modems LED is ON.

  If the modems LED lights, all modem modules present on the card pass diagnostics. You can also verify modem operation by using the **show modem** command.

  If the modems LED fails to light, you have a faulty CT1/CE1 trunk card. Return the modem card to the factory for a replacement.

For further installation troubleshooting information, refer to the *Cisco AS5800 Universal Access Server Hardware Installation Guide*.

Configuring the Modems

The Cisco 5814 dial shelf is designed to recognize modem cards in slots 0 to 11 within the dial shelf chassis. If you are installing ten modem cards in the dial shelf chassis, we recommend that you install modem cards in slots 2 to 11 and reserve slots 0 and 1 for trunk cards.

Note Only slots 0 to 5 are designed to recognize trunk cards and are prioritized for clock selection, beginning with slot 0. Therefore, you must install trunk cards in the first six slots.

If you are replacing a dial shelf card by installing a new dial shelf card of the same type in the same slot, the system software recognizes the new dial shelf card interfaces and brings them up automatically. No additional configuration is needed.

Table 4-3 lists commands to help you configure your double-density modem card.

Table 4-3 Configuring Double-Density Modem Cards

	Command	Description

Step 1	`AS5800> enable`
	`Password: password`
	`AS5800#`
		Enter the **enable** command.
		Enter your password.
		You are in privileged EXEC mode when the prompt changes to `AS5800#`.

Step 2	`AS5800# configure terminal`
	`Enter configuration commands, one per line. End with CNTL/Z.`
	`AS5800(config)#`
		Enter global configuration mode by typing the **configure** command. The example uses the terminal configuration option.
		You are in global configuration mode when the prompt changes to `AS5800(config)#`.

Step 3	`AS5800(config)# modem country country_name`	Specify the country to set the modem parameters (including country code and encoding) for MICA modems. The default is **usa** if the access server is configured with T1 interfaces and **e1-default** if the access server is configured with E1 interfaces.
Step 4	`AS5800(config-if)# line shelf/slot/port shelf/slot/port` `AS5800(config-line)#`	Enter the number of modem lines to configure. If you have 144 modems[1] on a modem card in slot 2 of a dial shelf identified as shelf 2, enter **2/2/0 2/2/143**.
Step 5	`AS5800(config-line)# transport input all`	Allow all protocols to be used when connecting to the line.
Step 6	`AS5800(config-line)# autoselect ppp`	Enable remote IP users running a PPP application to dial in, bypass the EXEC facility, and connect directly to the network.
Step 7	`AS5800(config-line)# modem inout`	Enable incoming and outgoing calls.

Step 8	`AS5800(config-line)# exit`
	`AS5800(config)#`
	`[or]`
	`AS5800(config-line)# Ctrl-Z`
	`AS5800#`
		Type the **exit** command to exit out of line configuration mode.
		Press the **Return** key to verify your command registers, then type **Ctrl-Z** to return to privileged EXEC mode.

Step 9	`AS5800# copy running-config startup-config`	Save your changes when ready.

1. Each CT1/CE1 trunk card contains 12 DMM SIMMs. Each DMM SIMM has 12 digital modems.

If you are installing a new modem card into the dial shelf, additional configuration is needed. For additional software configuration information, refer to the *Cisco AS5800 Universal Access Server Operation, Administration, Maintenance, and Provisioning Guide* that shipped with your system.

Table 4-4 contains the commands to help you configure your double-density modem lines.

Table 4-4 Configuring Double-Density Modem Lines

	Command	Description

Step 1	`AS5800> enable`
	`Password: password`
	`AS5800#`
		Enter the **enable** command.
		Enter your password.
		You are in privileged EXEC mode when the prompt changes to `AS5800#`.

Step 2	`AS5800# configure terminal`
	`Enter configuration commands, one per line. End with CNTL/Z.`
	`AS5800(config)#`
		Enter global configuration mode by typing the **configure** command. The example uses the terminal configuration option.
		You are in global configuration mode when the prompt changes to `AS5800(config)#`.

Step 3	`AS5800(config)# line shelf/slot/port shelf/slot/port`	Configure lines *shelf/slot/***1** to *shelf/slot/xx*. You are in line configuration mode when the prompt changes to `AS5800(config-line)#`.
Step 4	`AS5800(config-line)# modem inout`	Enable incoming and outgoing calls.
Step 5	`AS5800(config-line)# modem autoconfigure type modem-name mica_hdms`	Configure the line to attempt to configure the attached modem and select a modem type.
Step 6	`AS5800(config-line)# transport input all`	Configure the transport input to select all protocols.
Step 7	`AS5800(config-line)# stopbits 1`	Configure stop bits.
Step 8	`AS5800(config-line)# flowcontrol hardware {in | out}`	Set hardware flow control and direction.
Step 9	`AS5800(config-line)# login local`	Enable password checking at login. The example uses local authentication based on user name.
Step 10	`AS5800(config-line)# autoselect during-login`	Configure a line to start a session.
Step 11	`AS5800(config-line)# autoselect ppp`	Configure PPP.

Step 12	`AS5800(config-line)# exit`
	`AS5800(config)#`
	[or]
	`AS5800(config-line)# Ctrl-Z`
	`AS5800#`
		Type the **exit** command to exit out of line configuration mode.
		Press the **Return** key to verify your command registers, then type **Ctrl-Z** to return to privileged EXEC mode.

Step 13	`AS5800# copy running-config startup-config`	Save your changes when ready.

CHAPTER 5

Cisco AS5800 Voice-over-IP Card

The Cisco AS5800 Voice-over-IP (VoIP) card is a multi-DSP (digital signal processor) coprocessing board and software package that adds VoIP capabilities to the Cisco AS5800 platform. The Cisco AS5800 Voice-over-IP (VoIP) card is available in a fully-populated or half-populated hardware version, and in software versions that are referred to as high-complexity and medium complexity. The Cisco AS5800 CT1/CE1 trunk card resides in the dial shelf of the Cisco AS5800 platform. The onboard DSPs provide the signal processing functionality to convert voice/fax information into IP packets. The DSPs are mounted on 8 or 16 daughter cards or Digital Signal Processing Modules (DSPMs). The fully-populated version has 96 DSPs, and the half-populated version has 48 DSPs. Each DSP can handle as many as two high-complexity and up to four medium-complexity sessions. The Cisco AS5800 CT1/CE1 trunk cards support multiple voice codecs, fax relay, and H.323 signaling.

The fully-populated, high complexity version Cisco AS5800 CT1/CE1 trunk card supports up to 192 packetized voice/fax calls and a wide range of codecs including G.711, G.729, G.729a, G.726, G.728, and G.723.1. The fully-populated, medium complexity version supports as many as 336 voice connections and the G.711, G.729a, and G.726 codecs. The half-populated, high complexity version Cisco AS5800 CT1/CE1 trunk card supports up to 96 packetized voice/fax calls and a wide range of codecs including G.711, G.729, G.729a, G.726, G.728, and G.723.1. The half-populated, medium complexity version supports as many as 192 voice connections and the G.711, G.729a, and G.726 codecs. A Cisco AS5800 configured as a voice gateway can support as many as 1,344 voice calls (requires four fully-populated, medium complexity cards).

Note For maximum port capacity, the Cisco AS5800 configured as a voice gateway must be running in split dial shelf configuration with two 7206VXR router shelves. Refer to the *Cisco AS5800 Universal Access Server Operation, Administration, Maintenance, and Provisioning Guide* for split dial shelf configuration information.

For detailed software configuration information, refer to *Voice over IP for the Cisco AS5800*, an online document available at the following URL:

http://www.cisco.com/univercd/cc/td/doc/product/access/nubuvoip/voip5800/index.htm.

You can use the Cisco AS5800 CT1/CE1 trunk card in the following applications:

- Toll bypass/Tandem
- Geographically dispersed networking over WANs
- Mixed voice/data services including wholesale voice and data
- PC-to-phone gateway
- Debit/calling card applications

- Post paid applications
- PSTN voice traffic offload to packet networks
- Clearing house and open settlement protocol (OSP) applications

Caution In certain countries, use of these products or provision of voice telephony over the Internet may be prohibited or subject to laws, regulations, or licenses, including requirements applicable to the use of the products under telecommunications and other laws and regulations; the customer must comply with all such applicable laws in the country or countries where the customer intends to use the product.

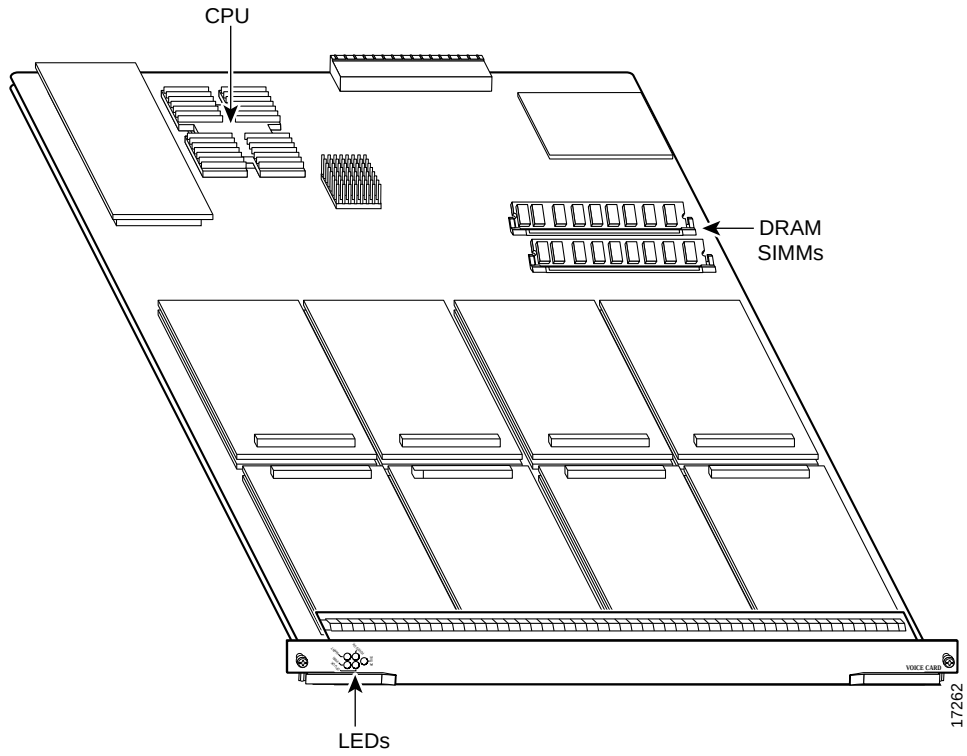
Hardware Features

The Cisco AS5800 CT1/CE1 trunk card contains 8 (half-populated) or 16 (fully-populated) DSPMs and a 250-MHz CPU. The DSPMs are contained on 8 or 16 double-stacked daughtercards on the VoIP card.

The Cisco AS5800 VoIP card occupies a single slot in the Cisco 5814 dial shelf and connects to the LAN/WAN interface cards through the TDM backplane bus.

Figure 5-1 shows a side view of the Cisco AS5800 CT1/CE1 trunk card.

Figure 5-1 CT1/CE1 Trunk Card (Fully Populated Card Shown)



Software Features

High-complexity VoIP cards can handle two VoIP sessions per DSP. A Cisco AS5800 configured as a voice gateway and equipped with high-complexity CT1/CE1 trunk cards supports the following software features, codecs, and protocols:

- H.323 call signaling (versions 1, 2, and 3)
- H.323 gatekeeper support
- The following codecs:
  - g711alaw G.711 A-Law 64,000 bps
  - g711ulaw G.711 u-Law 64,000 bps
  - g723r53 G.723.1 5,300 bps
  - g723r63 G.723.1 6,300 bps
  - g726r16 G.726 16,000 bps
  - g726r24 G.726 24,000 bps
  - g726r32 G.726 32,000 bps
  - g728 G.728 16,000 bps
  - g729abr8 G.729 ANNEX-A and B 8,000 bps
  - g729ar8 G.729 ANNEX-A 8,000 bps
  - g729r8 G.729 8,000 bps
- Voice activity detection (VAD)
- Echo cancellation (128 ms)
- Interactive voice response (IVR) and authentication, authorization, and accounting (AAA) for two-stage dialing
- T1/E1 PRI signaling and T1 CAS signaling

Medium-complexity VoIP cards can handle four VoIP sessions per DSP, but support fewer codecs. The medium-complexity CT1/CE1 trunk card supports the following software features, codecs, and protocols:

- H.323 call signaling
- H.323 gatekeeper support
- The following codecs:
  - g711alaw G.711 A Law 64,000 bps
  - g711ulaw G.711 u Law 64,000 bps
  - g726r16 G.726 16,000 bps
  - g726r24 G.726 24,000 bps
  - g726r32 G.726 32,000 bps
  - g729abr8 G.729 ANNEX-A and B 8,000 bps
  - g729ar8 G.729 ANNEX-A 8,000 bps
  - g729r8 G.729 8,000 bps
- Voice activity detection (VAD)

- Echo cancellation (128 ms)
- Interactive voice response (IVR) and authentication, authorization, and accounting (AAA) for two-stage dialing
- T1/E1 PRI signaling and T1 CAS signaling
- E1 R2 CAS signaling
- NFAS
- FG-B FG-D

Port densities that are supported on the VoIP card are listed in Table 5-1.

Table 5-1 Supported Port Densities

Complexity	Codecs	Populated	Max Ports Supported
High	G.711, G.729, G.729a, G.726, G.728, G.723.1	full	192
		half	96
Medium	G.711, G.729a, G.726	full	336[1]
		half	192

1. Only 20 msec or higher packetization supported, VAD required.

For detailed software configuration information refer to *Voice over IP for the Cisco AS5800*, available at:

http://www.cisco.com/univercd/cc/td/doc/product/access/nubuvoip/voip5800/index.htm.

Additional information relating to medium-complexity or half-populated VoIP cards for the Cisco AS5800 is at:

http://www.cisco.com/univercd/cc/td/doc/product/access/acs_serv/as5800/12_2t/index.htm.

The **show dial-shelf** command does not indicate whether a VoIP card is fully-populated or half-populated, but it will indicate high-complexity (HC) or medium-complexity (MC). To find out how many DSPs are present on a VoIP card, use the **show vrm vdevice summary** command.

Note Mixing high-complexity and medium-complexity VoIP cards in the Cisco AS5800 is only supported if all VoIP cards in one split of the shelf are of the same complexity. VoIP cards in the other split of the same Cisco 5814 dial shelf may be of the other type, but all VoIP cards in a split must be of the same type.

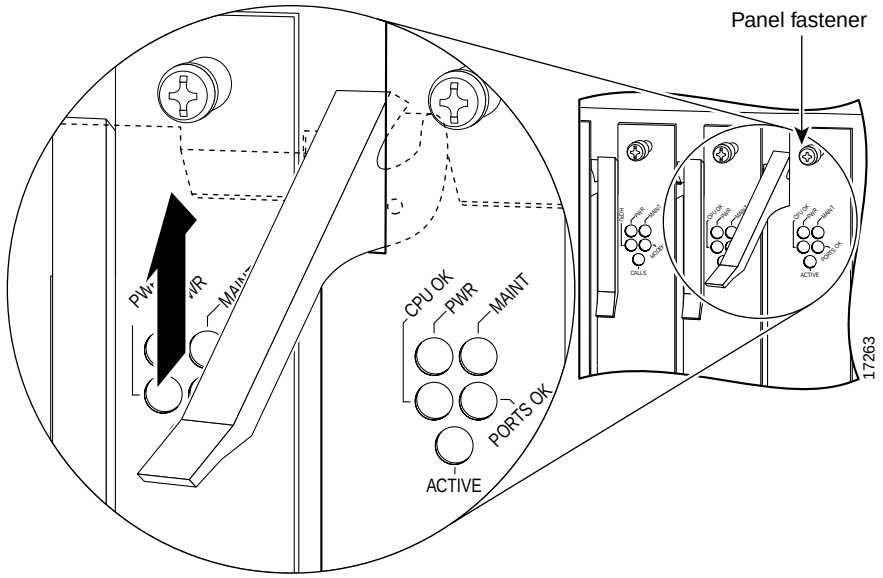
Indicators

The Cisco AS5800 CT1/CE1 trunk card contains five front-panel status LEDs (see Table 5-2). Figure 5-2 shows the location of the status LEDs.

Table 5-2 CT1/CE1 Trunk Card Status LEDs

LED	Color	Description
PWR	Green	On when power is supplied.
MAINT	Yellow	On when the card is manually out of service for maintenance.
CPU OK	Green	On after the card passes diagnostics.
PORTS OK	Green	On after DSPM diagnostics are successfully completed.
ACTIVE	Green	On when active calls are present.

Figure 5-2 Front Panel LEDs



Software Requirements

The CT1/CE1 trunk card and the DSP modules require Cisco IOS Release 12.0(4) XL or higher on the Cisco AS5800.

For detailed software configuration information for high-complexity VoIP cards, refer to *Voice over IP for the Cisco AS5800*, available at:

http://www.cisco.com/univercd/cc/td/doc/product/access/nubuvoip/voip5800/index.htm.

Additional information relating to medium-complexity or half-populated VoIP cards for the Cisco AS5800 is at:

http://www.cisco.com/univercd/cc/td/doc/product/access/acs_serv/as5800/12_2t/index.htm.

CHAPTER 6

CT1/CE1 Trunk Card

The Cisco AS5800 universal access server is equipped with modem cards for converting analog pulse code modulation (PCM) bitstreams to digital data. This chapter provides an overview of the 324 universal port card (CT1/CE1 trunk card), which supports modem services, and also includes steps for configuring your software and verifying and troubleshooting your CT1/CE1 trunk card installation. See Chapter 4 for information on the DMM modem card.

CT1/CE1 Trunk Card Overview

A universal port is a port that can carry the equivalent of one DS0 of network traffic. Network traffic can be a modem or fax connection.

Note The 324 Universal Port Card supports data only when installed in the Cisco AS5800. Voice support is also available when the 324 UPC is installed in the Cisco AS5850.

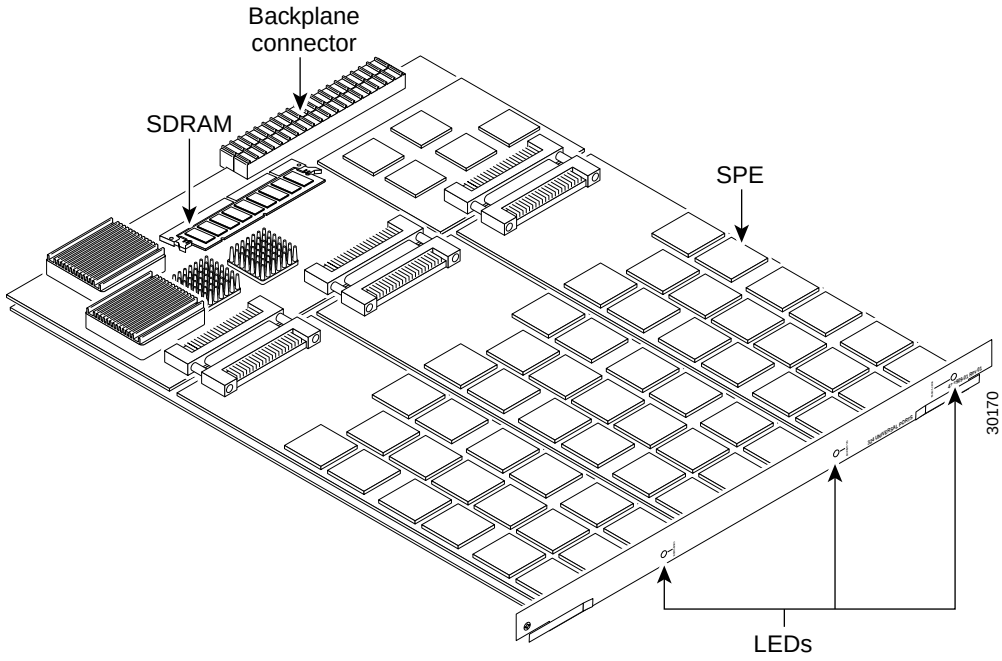
The 324 universal port card uses NextPort hardware and firmware to provide universal ports for the Cisco AS5800 (thus the UPC is sometimes referred to as a NextPort module). These ports are grouped into SPEs. An SPE is a service processing element, supporting six universal ports. There are 54 SPEs per CT1/CE1 trunk card, for a total of 324 ports per CT1/CE1 trunk card. Each CT1/CE1 trunk card also has a minimum of a 64-MB SDRAM card. Configuration, management, and troubleshooting of universal ports can be done at the CT1/CE1 trunk card, SPE, and port level.

The Cisco AS5800 can be equipped with a maximum of seven CT1/CE1 trunk cards with upgradable firmware. Currently the CT1/CE1 trunk card supports data traffic, and is universal port capable, depending on the software and platform. Each CT1/CE1 trunk card plugs directly into the dial shelf backplane and has no external connections. Each CT1/CE1 trunk card has three LEDs, which indicate card status.

The Cisco AS5800 is capable of terminating as many as 2,048 port connections (slightly more than an OC-3) when equipped with seven CT1/CE1 trunk cards and three CT3 trunk cards. A split shelf configuration with a second router shelf, and second dial shelf controller are required to achieve full capacity. For details on configuring a Cisco AS5800 for maximum capacity, refer to the “Configuring Split Dial Shelves” section on page 6-10. A single router and a standard configuration supports as many as 1,344 port connections. Cisco IOS Release 12.1(2)XD is required for the CT1/CE1 trunk card. Unless your system has shipped with UPCs installed, you need to upgrade the Cisco IOS image on the dial shelf and router shelf or shelves.

Figure 6-1 shows the CT1/CE1 trunk card components.

Figure 6-1 CT1/CE1 Trunk Card Components



The CT1/CE1 trunk card performs the following functions:

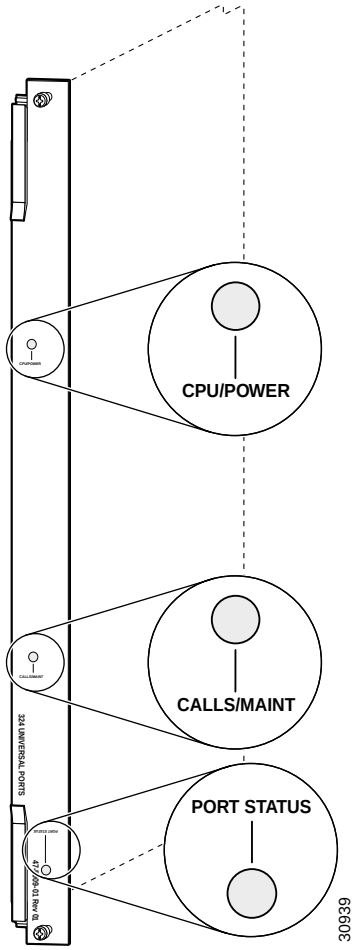
- Converts pulse code modulation (PCM) bitstreams to digital packet data.
- Forwards converted and packetized data to the dial shelf main processor, which examines the data and forwards it to the router shelf. From the router shelf, the data is routed to the external network.
- Supports all modem standards (such as V.34 and V.42*bis*) and features, including dial-in and dial-out.
- Supports online insertion and removal (OIR), a feature that allows you to remove and replace CT1/CE1 trunk cards while the system is operating. CT1/CE1 trunk cards can be removed without disrupting the operation of other cards and their associated calls. If a CT1/CE1 trunk card is removed while the system is operating, connections or current calls on that card are dropped. Calls that are being handled by other cards are not affected.

You can install a CT1/CE1 trunk card in the slots numbered 2 to 11 on the dial shelf. If installed in slots 0 or 1 the CT1/CE1 trunk card is automatically powered down. We recommend that you install mixes of T3 and T1 cards, or E1 trunk cards in slots 2 to 5. Trunk cards are required for call termination and can only operate in slots 0 to 5. You can use double-density modem cards, CT1/CE1 trunk cards, and VoIP cards simultaneously.

LED Indicators

The CT1/CE1 trunk card has three LEDs (see Figure 6-2) to indicate card status. These LEDs can be green, yellow, or OFF.

Figure 6-2 CT1/CE1 Trunk Card Front Panel LEDs



During normal operation, all three LEDs light as described in Table 6-1.

Table 6-1 CT1/CE1 Trunk Card LED Descriptions

LED	State	Description
CPU/POWER	Green	CT1/CE1 trunk card passed diagnostics and the card CPU is operating properly.
	Yellow	Lights shortly after the card is powered ON[1]. Card CPU diagnostics start when the card starts receiving power, and the LED remains yellow while the diagnostics run.
	OFF	UPC not receiving power, or portware failed to load. If the portware fails to load onto the card, the Cisco AS5800 will attempt to reload the portware automatically. If a programmed number of attempts to reload the portware fails, the Cisco AS5800 will power OFF the CT1/CE1 trunk card.
CALLS/MAINT	Green	The LED lights when at least one active call is switched through the card.
	Yellow	Indicates card OIR status. The LED is yellow when the card has been busied out and has no calls, and may be removed without interrupting service.
	OFF	The CALLS/MAINT LED is not lit if there is no traffic on the card and the card has not been busied out.
PORT STATUS	Green	Lights when all SPE modules have passed diagnostics and are operating properly.
	OFF	LED remains OFF until diagnostics are complete. If this LED stays OFF, one or more SPE modules are missing from the card, or one or more SPEs failed diagnostics.

1. There is a slight delay from the time that power is applied to the card and the time that this LED lights.

SPE Firmware

SPE firmware is automatically downloaded to a CT1/CE1 trunk card from the dial shelf Cisco IOS image when you boot the system for the first time, or when you insert a CT1/CE1 trunk card while the system is operating. When you insert a CT1/CE1 trunk card while the system is operating, the Cisco IOS image recognizes the card and the dial shelf downloads the required portware to the cards. Cisco IOS Release 12.1(2)XD is required for the CT1/CE1 trunk card.

The SPE firmware image (also known as *portware*) is bundled with the Cisco IOS CT1/CE1 trunk card image. The SPE firmware image uses an *auto detect* mechanism, which enables the CT1/CE1 trunk card to service multiple call types. An SPE detects the call type and automatically configures itself for that operation. You can upgrade the firmware without upgrading Cisco IOS software, and different firmware versions can be configured to run on SPEs in the same UPC.

The SPEs can be programmed to collect ANI (calling number) and DNIS (called number) digits for caller identification information when the trunk cards are configured in channel associated signaling (CAS) mode. The SPE passes the ANI/DNIS information to the CT1/CE1 trunk card software with a portware mailbox message.

The CT1/CE1 trunk card supports the modem standards and features listed in Table 6-2.

Table 6-2 Modem Standards and Supported Features

Feature	Description
Carrier protocols	ITU V.23 at 75/1200 bps
	Telcordia Technologies (formerly Bellcore) 103 at 300 bps
	ITU V.21 at 300 bps
	ITU V.22 at 1200 bps
	Telcordia Technologies (formerly Bellcore) 212A at 1200 bps
	ITU V.22*bis* at 2400 bps
	ITU V.32 up to 9600 bps
	ITU V.32*bis* up to 14,400 bps
	V.32 turbo up to 19,200 bps
	V.FC up to 28,800 bps
	V.34 up to 28,800 bps
	V.34+ up to 33.6 bps
	TIA/ITU V.90
	K56flex
Error-correcting link-access protocols	V.42 LAPM, MNP 2-4
Compression protocols	V.42*bis* (includes MNP 5)
Command interface	Superset of the AT command set
In-band signaling/tone generation and detection	DTMF generation
	DTMF detection
	MF generation
	MF detection
Other	Out-of-band access for management
	PPP and SLIP framing

Verifying and Troubleshooting the Installation

Cisco IOS Release 12.1(2)XD is required for the CT1/CE1 trunk card. The LEDs will not function without the proper Cisco IOS image running on the dial shelf. If you need to upgrade your Cisco IOS image, refer to *Managing and Troubleshooting NextPort Services on the UPC*, at:

http://www.cisco.com/univercd/cc/td/doc/product/access/acs_serv/as5800/58featur/58nextpt.htm.

During normal operation, all three CT1/CE1 trunk card LEDs light when the CT1/CE1 trunk card is powered ON. When the CT1/CE1 trunk card CPU software starts running, it shuts OFF all LEDs except the power LED. The LEDs then light again as described in Table 6-1.

To complete the installation, verify that the CT1/CE1 trunk card LEDs operate properly by observing the following LED states:

- The CPU/POWER LED is ON and yellow or green.

  If the CPU/POWER LED remains OFF, verify that the card is seated properly.

Note If the portware fails to load onto the SPEs, the Cisco AS5800 will attempt to reload the portware automatically. If a programmed number of attempts to reload the portware fails, the Cisco AS5800 will power OFF the CT1/CE1 trunk card.

  If the CPU/POWER LED is yellow, diagnostics are still running on the CT1/CE1 trunk card. If the CPU/POWER LED stays yellow, contact CCO. To contact the Cisco Technical Assistance Center (TAC) refer to the "Obtaining Technical Assistance" section on page xv.

  If the power LED lights on other CT1/CE1 trunk card s in the dial shelf, try inserting the CT1/CE1 trunk card in a different slot. If none of the power LEDs light, check your dial shelf power connections, power entry modules, and AC-input power supplies (if present).

- The CALLS/MAINT LED is ON and green or yellow.

  If the CALLS/MAINT LED is OFF but the power LED is ON, there is no traffic on the card.

  Verify that the other cards in the dial shelf work correctly. Verify that the card is seated properly. Try inserting the card in a different slot. Verify that you are using the correct portware using the **show spe version** command.

- The PORT STATUS LED is ON and green.

  If the PORT STATUS LED is green, all SPEs present on the card pass diagnostics. You can also verify SPE operation by using the **show spe** command.

  If the PORT STATUS LED is OFF, one or more SPEs present on the card have failed diagnostics.

If troubleshooting reveals problems with the CT1/CE1 trunk card, arrange to replace the CT1/CE1 trunk card. To contact the Cisco Technical Assistance Center (TAC) refer to the "Obtaining Technical Assistance" section on page xv.

Show Modem/Show SPE

Note The **show modem** command will not show SPEs on the CT1/CE1 trunk card, but will show MICA modems (DMM) if present.

To verify proper function of a CT1/CE1 trunk card in a Cisco AS5800, you must use the **show spe** command and its variants described in *Managing and Troubleshooting NextPort Services on the UPC*, available online at:

http://www.cisco.com/univercd/td/doc/product/access/acs_serv/as5800/58featur/58nextpt.htm.

For further troubleshooting information, refer to the *Cisco AS5800 Universal Access Server Hardware Installation Guide*.

Configuring the Ports

Timesaver The Cisco AS5800 recognizes CT1/CE1 trunk cards in slots 2 to 11 within the dial shelf chassis. If you are installing seven CT1/CE1 trunk cards in the dial shelf chassis, we recommend that you install CT1/CE1 trunk cards in slots 3 to 9 and reserve slots 0 to 2 for trunk cards.

Note Only slots 0 to 5 are designed to recognize trunk cards and are prioritized for clock selection, beginning with slot 0. Therefore, you must install trunk cards in the first six slots.

If you are replacing a dial shelf card with a new dial shelf card of the same type in the same slot, the system software recognizes the new dial shelf card interfaces and brings them up automatically. No additional configuration is needed.

You must insert the UPC in the desired slot as described in Chapter 1, "Replacing or Installing Dial Shelf Cards."

Before you configure your access server to use UPCs, load the proper Cisco IOS images on both the router shelf or shelves, and the dial shelf.

Table 6-3 contains sample commands to help you configure your CT1/CE1 trunk card for basic dialup service.

Table 6-3 Configuring UPC Ports

	Command	Description

Step 1	`AS5800> enable`
	`Password: password`
	`AS5800#`
		Enter the **enable** command.
		Enter your password.
		You are in privileged EXEC mode when the prompt changes to `AS5800#`.

Step 2	`AS5800# configure terminal`
	`Enter configuration commands, one per line. End with CNTL/Z.`
	`AS5800(config)#`
		Enter global configuration mode by typing the **configure** command. The example uses the terminal configuration option.
		You are in global configuration mode when the prompt changes to `AS5800(config)#`.

Step 3	`AS5800(config)# spe country country_name`	Specify the country to set the NextPort module parameters (including country code and encoding) for NextPort and MICA modules. The default is **usa** if the access server is configured with T1 interfaces and **e1-default** if the access server has E1 interfaces. Use the **no** form of this command to set the country code to the default of **domestic**. All sessions on all modules in all slots must be IDLE for this command to run.
Step 4	`AS5800(config)# line shelf/slot/port shelf/slot/port`	Configure lines *shelf/slot/***1** *shelf/slot/xx* as ports on the UPC. To identically configure all ports on a UPC in slot six on shelf one, enter **line 1/6/00 1/6/323**. Ports are numbered starting with 0. You are in line configuration mode when the prompt changes to `AS5800(config-line)#`.

Table 6-3 Configuring UPC Ports (continued)

	Command	Description
Step 5	`AS5800(config-line)# modem inout`	Enable incoming and outgoing calls.
Step 6	`AS5800(config-line)# transport preferred none`	Set no preferred transport protocol for connecting to the Cisco AS5800 and using the Cisco IOS CLI.
Step 7	`AS5800(config-line)# transport input all`	Allow all supported transport protocols to be used when connecting to the terminal server.
Step 8	`AS5800(config-line)# session-timeout` *minutes*	Close connections when there is no input traffic for the specified number of minutes.
Step 9	`AS5800(config-line)# exec-timeout` *minutes seconds*	Set the EXEC timeout for the specified number of minutes and seconds.
Step 10	`AS5800(config-line)# autoselect during-login`	Configure ports to detect the connection protocol desired and start a session.
Step 11	`AS5800(config-line)# autoselect timeout` *seconds*	Set wait timeout for initial autoselect byte (in seconds).
Step 12	`AS5800(config-line)# autoselect ppp`	Set line to allow PPP autoselection. This allows remote IP users running a PPP application to dial in, bypass the EXEC facility, and automatically start PPP on the line.
Step 13	`AS5800(config-line)# absolute-timeout` *minutes*	Set absolute timeout for line disconnection to a maximum of 240 minutes.
Step 14	`AS5800(config-line)# no modem status poll`	Disable modem management status polling.
Step 15	`AS5800(config-line)# no modem log rs232`	Disable EIA/TIA 232 event logging.

Step 16	`AS5800(config-line)# exit`
	`AS5800(config)#`
	
	[or]
	
	`AS5800(config-line)# Ctrl-Z`
	`AS5800#`
		Type the **exit** command to exit out of line configuration mode.
		
		Press the **Return** key to verify your command registers, then press **Ctrl-z** to return to privileged EXEC mode.

Step 17	`AS5800# copy running-config startup-config`	Save your changes when ready.

Tips The **cdp enable** configuration command has changed. For the async and group async interfaces, the default is now *disabled*. Most other interfaces are enabled by default.

If you are installing a new CT1/CE1 trunk card into the dial shelf, no additional configuration is needed. For additional system software configuration information, refer to the *Cisco AS5800 Universal Access Server Operation, Administration, Maintenance, and Provisioning Guide*.

Configuring Split Dial Shelves

To achieve the maximum capacity of 2048 port connections using seven CT1/CE1 trunk cards and three T3 plus one T1 trunks requires a split dial shelf configuration using two router shelves. A new configuration command is available to define the split point: **`dial-shelf split backplane-ds0`** *option*.

The options for this command come in pairs, varying according to the desired configuration. You need to log in to each router shelf and separately configure the routers for their intended load. In most circumstances Cisco recommends that you select the predefined options. These options are designed to be matched pairs as seen in Table 6-4.

Table 6-4 Split-Shelf Option Pairs

	Router Shelf 1			Router Shelf 2			Total
Option Pair	Option	Maximum Calls	Unused T1	Option	Maximum Calls	Unused T1	
1	`2ct3cas`	1344	—	`1ct3cas`	672	—	2016
2	`part2ct1ct3cas`	1152	4	`part1ct1ct3cas`	888	3	2040
3	`2ct3isdn`	1288	—	`part1ct1ct3isdn_b`	644	7	1932
4	`part2ct1ct3isdn`	1150	2	`part1ct1ct3isdn`	897	1	2047
5[1]	`3ce1`	960	—	`3ce1`	960	—	1920
6	default (no option entered)	1/2 of current input	—	default (no option entered)	1/2 of current input	—	—
7	`no dial-shelf backplane-ds0`	1024	—	`no dial-shelf backplane-ds0`	1024	—	2048

1. This option is used to revert to the default for an environment using 6 E1 lines.

The **dial-shelf split slot 0 3 4 5** command must be defined and used for the **`dial-shelf split backplane-ds0`** *option* command to be available. You can also select the **user defined** option to define your own split.

Even if your system is already using a split dial shelf configuration, configuring one router shelf to handle two T3 trunks and the other router to handle the third trunk requires that you take the entire access server out of service. Busyout all connections before attempting to reconfigure. The configuration must be changed to setup one pool of TDM resources that can be used by either DMM cards or UPCs, and a second pool of two streams that contains TDM resources that can only be used by UPCs.

If you have more trunk capacity than 2048 calls, it is your decision how to provision the trunks so that the backplane capacity is not exceeded. If more calls come in than backplane DS0 capacity for that half of the split, the call is rejected and an error message is printed for each call. This cannot be detected while a new configuration is being built because the router cannot tell which T1 trunks are provisioned and which are not. You might want some trunks in hot standby.

The DMM, HMM, and VoIP cards can only use 1792 DS0 of the available 2048 backplane DS0. The UPC and trunk cards can use the full 2048 backplane DS0. The **show tdm splitbackplane** command will show the resources in two groups, the first 1792 accessible to all cards, and the remaining 256 accessible only to UPC and trunk cards.

Configuration Scenarios

The following configuration scenarios apply for environments using T3 CAS, T3 PRI, and E1 PRI:

T3 CAS

Option 1: Straight three T3 environment—two T3/ one T3 split

Router shelf 1, two T3s—**dial-shelf backplane-ds0 2ct3cas**

Router shelf 2, one T3—**dial-shelf backplane-ds0 1ct3cas**

This setting combination provides 1344 DS0s (four or five UPCs) to one router shelf and 672 DS0s (two or three UPCs) to the other for a total of 2016 possible analog calls terminated. This leaves 276 spare ports on the router shelf 1 side, and a shortage of 24 ports on the router shelf 2 side. One DMM card could be used to provide an additional 24 ports and spares for the router shelf 2 of the split.

Option 2: 3 T3—with 1 T3 demuxed into T1s plus an extra 1 T1 service in addition to the 3 T3s

Router shelf 1, one T3 plus two T1s—**dial-shelf backplane-ds0 part2ct1ct3cas**

Router shelf 2, one T3 plus one T1—**dial-shelf backplane-ds0 part1ct1ct3cas**

This setting combination provides 1152 DS0s (four UPCs) to one router shelf and 888 DS0s (three UPCs) to the other for a total of 2040 possible analog calls terminated. This leaves 144 spare ports on the router shelf 1 side, and 84 spare ports on the router shelf 2 side. This leaves one empty slot, but does not require any DMMs to be added. The router shelf load in this configuration is more even than in option 1.

T3 PRI

Option 3: 3 CT3 environment—Straight two CT3/one CT3 split

Router shelf 1, two T3s—**dial-shelf backplane-ds0 2ct3isdn**

Router shelf 2, one T3—**dial-shelf backplane-ds0 part1ct1ct3isdn_b**

This setting combination provides 1288 DS0s (four UPCs) to one router shelf and 644 DS0s (two UPCs) to the other for a total of 1932 analog calls terminated. This leaves only eight spare ports on the router shelf 1 side, and four spare ports on the router shelf 2 side. This also leaves three empty slots so one DMM per side can be added to provide spare modems if required. The router shelf load in this configuration is somewhat uneven: one router shelf is heavily loaded, the other is at half capacity.

Option 4: 3 CT3 environment—with a MUX to split 1 CT3 into CT1s PLUS an extra 5 CT1 services in addition to the 3 CT3s

Router shelf 1, one T3 plus two T1s—**dial-shelf backplane-ds0 part2ct1ct3isdn**

Router shelf 2, one T3 plus one T1—**dial-shelf backplane-ds0 part1ct1ct3isdn**

This setting combination provides 1150 DS0s (four UPCs) to one router shelf and 897 DS0s (three UPCs) to the other for a total of 2047 analog calls terminated. This leaves 146 spare ports on the router shelf 1 side, and 75 spare ports on the router shelf 2 side. This leaves one empty slot, but does not require any DMMs to be added. The router shelf load in this configuration is more even than in option 1.

E1-PRI

Option 5: 6 E1-PRI environment

Router shelf 1, three E1s— **3ce1**

Router shelf 2, three E1s—**3ce1**

This setting combination provides 960 DS0s (three UPCs) to one router shelf and 960 DS0s (three UPCs) to the other for a total of 1920 possible analog calls terminated. This leaves 12 spare ports on the router shelf 1 side, and 12 spare ports on the router shelf 2 side. This leaves no empty slots, but does not require any DMMs to be added. The router shelf load in this configuration is evenly split.

Diagnostic Commands

To see the current backplane status, use the **show tdm splitbackplane** command.

```
AS5800# show tdm splitbackplane

Backplane timeslot Map Key
F = timeslot free, U = timeslot used, o = used but other router
L = timeslot lost, C = timeslot clashes - in use on both RS


TDM resource pool Modem(DMM),Modem(HMM),Voice(DSPM549) BP Slots
max timeslots 1792, split_ds_limit 632
first timeslot 0, last timeslot 1791
Number of timeslots used by this Router Shelf  :0
Number of timeslots free on this Router Shelf  :632
Number of timeslots used by other Router Shelf :1160

 Stream 0
 0- 63:oooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooo
64-127:oooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooo

 Stream 1
 0- 63:oooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooo
64-127:oooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooo

 Stream 2
 0- 63:oooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooo
64-127:oooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooo

 Stream 3
 0- 63:oooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooo
64-127:oooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooo

 Stream 4
 0- 63:oooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooo
64-127:oooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooo

 Stream 5
 0- 63:oooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooo
64-127:oooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooo

 Stream 6
 0- 63:oooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooo
64-127:oooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooo

 Stream 7
 0- 63:oooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooo
64-127:oooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooo

 Stream 8
 0- 63:oooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooo
64-127:oooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooo

 Stream 9
 0- 63:oooooooooFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF
64-127:FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF

 Stream 10
 0- 63:FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF
64-127:FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF
```

```
 Stream 11
 0- 63:FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF
64-127:FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF

 Stream 12
 0- 63:FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF
64-127:FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF

 Stream 13
 0- 63:FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF
64-127:FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF

TDM resource pool raiko legacy BP Slots
max timeslots 256, split_ds_limit 128
first timeslot 1792, last timeslot 2047
Number of timeslots used by this Router Shelf  :0
Number of timeslots free on this Router Shelf  :128
Number of timeslots used by other Router Shelf :128

 Stream 14
 0- 63:oooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooo
64-127:oooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooo

 Stream 15
 0- 63:FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF
64-127:FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF

  Backplane Information
backplane-ds0:part1ct1ct3isdn_b
Other Router Shelf backplane-ds0:2ct3isdn
```

For More Information

For further information useful in troubleshooting or managing the CT1/CE1 trunk card, refer to *Managing and Troubleshooting NextPort Services on the UPC* at:

http://www.cisco.com/univercd/cc/td/doc/product/access/acs_serv/as5800/58featur/58nextpt.htm.

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